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Helsinki

**ROMAN-PERIOD ROOF TILES IN THE
EASTERN MEDITERRANEAN**

TOWARDS REGIONAL TYPOLOGIES

Pirjo Hamari

ACADEMIC DISSERTATION

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ABSTRACT

This study analyses the types and use contexts of ceramic roof tiles in the eastern part of the Roman Empire. Despite ceramic roof tiles being one of the most frequent finds from archaeological excavations and surveys of this period from the Mediterranean area, they have not received much interest in research. In particular, the study of plain, undecorated, or unstamped tiles has been extremely limited considering the volume of material found.

This study looks at roof tile assemblages from three different excavations across the eastern Mediterranean. Based on this body of material, and collecting comparative evidence from published research, the study builds a picture of the types of roof tiles used in the area during the Roman period. By doing this, it addresses a sizable gap in our knowledge on the typological development and regional distribution of roof tile types in the study area. Chronologically, the research covers a period from the 1st to the 5th centuries CE, coinciding with the Roman dominance in the area. Spatially, it reaches from Roman Greece to the Roman Near East.

The three tile assemblages at the core of the study come from the Early Christian church site of Paliambela in northern Greece, the Nabataean-Roman house IV on Ez Zantur in Petra, and the Early Christian church and monastery on Jabal Haroun near Petra, both in Jordan. These assemblages, consisting of different components of tiled roofs (undecorated pan and cover tiles), represent well preserved and well documented excavation assemblages of roof tiles. In this study, methods typically applied in the study of plain pottery have been adapted to this material, namely the study of forms (typology) and the study of fabrics (compositional analysis). Typology is used as the key explanatory tool for the material. In addition to applying a methodology based on form, the study uses x-ray fluorescence (microXRF) to analyse the composition of the tile fabrics from one of the assemblages, in order to study the particulars of the production process.

The results shed new light on the practice of roof tiling in the eastern part of the Mediterranean, on regional types and variations of tile types in the Roman period, and on societal aspects related to tile production and use. The study confirms that the tile types used in this area are derivatives of earlier eastern types, rather than emulations of Roman types, and an adherence to the use of the specific combinations of pan and cover tiles that originally defined the early Greek tile systems (Laconian, Corinthian, and Hybrid) continues throughout the period under study. Despite the conservatism apparent in the general forms, the study recognizes potential typological traits in the Roman-period tile types, through which their development could be followed. Moreover, it highlights the regional variation present in this seemingly uniform material. This reinforces the view that more detailed regional typologies for plain roof tiles are possible in this area.

The data underlying the research does not currently allow for the development of full regional typologies, but a preliminary hypothesis is formed about the tile regions in the study area for the Roman period. Three separate macro regions are identified, based on the types of tile used, corresponding roughly to Roman Greece, Roman Asia Minor, and the Roman Near East.

In addition to defining tile regions and types, the study reveals a large variation in the use contexts of roof tiles in this area during the Roman period, which is reflected in the presence and frequency of tiles in the archaeological landscape. In summary, while frequent in the Greek archaeological record of the Roman period, ceramic tile has a very low to minimal penetration into the Roman-period countryside of the Near East, in particular southern Levant. In this area, tile use contexts are limited to public urban and grander domestic architecture.

The study also examines the production contexts of the tiles. For all of the case study sites, the production of tiles is assessed to have been local. The general picture is of continued technical traditions in small production units, although an increase in the use and volumes of production for roof tiles towards the 5th and 6th centuries CE is evident. In contrast, several questions related to production, distribution and markets could not be examined due to the nature of the material studied.

The research places a particular focus on the various fingerline signatures on the 5th-century CE Laconian-style roof tiles from Paliambela. A compositional analysis performed on the tile fabric confirms that most of these signatures belong to the same provenance group. This indicates that the different signatures do not directly represent different workshops, as has generally been assumed earlier. It seems more likely that they represent events or points of information in the internal production processes of a workshop.

Finally, the study analyses roof tiles in their social context. One such aspect is related to the process of Romanization, or the processes of cultural transformation after the Roman conquest of the provinces. It is demonstrated that there are no visible signs in these particular assemblages, either typological or technical, to indicate that the conquest influenced the production of roof tiles in the East to any wider degree; on the contrary, signs of either unrelated development, and possibly even conscious resistance through the choice of types and styles, is visible. The study also highlights the role of tiles as parts of the visual fabric of cities, in the form of roofscapes, or the view offered by the different roofs. It is demonstrated that in Petra, as a part of the Hellenizing tendency in public building, tiled roofs formed conspicuous parts of the Petra roofscape, emphasizing parts of the city as public and urban as opposed to those areas that were more private and traditional.

The results clearly indicate that with improved and routinely applied documentation of tile assemblages, valuable new data would become

available for archaeological research in this area. With a better understanding of the typology, technology, and the use contexts of roof tiles, there is much potential for improving our understanding of how people, ideas, and materials related to tiles moved within and between regions. This in turn can clarify questions related to technology transfer, the adoption of materials and ideas, crafts industries, trade, economy, and eventually the transformation of societies over time.

ACKNOWLEDGEMENTS

This work has been long in the making, and therefore has included the help of a great many people and institutions, only a few of whom can be personally mentioned here. Although I had been deeply interested in classical archaeology during my graduate studies, the practicalities of life separated me from research for a period after graduation. When an opportunity to participate in the excavations at Paliambela in Greece during the summer 2000 presented itself to me, I was happy to take it. In Paliambela, I was first introduced to the absorbing world of ceramic roof tiles. I am indebted to prof. Arja Karivieri for taking an interest in this material and offering me the chance to study it. Arja has further been my supervisor and a constant, positive support in my work.

The same kind of opportunity was also offered to me by my other supervisor, Dr. Zbigniew Fiema, who similarly paid attention to an outlying and neglected material and offered it to me for research from the Finnish expedition to the Mountain of Aaron some years later. Zbig has been a constant support, reviewing and improving my work with speed, thoroughness and a great scholarly competence. I am extremely grateful for all his advice and his steadfastness in providing support and comments. Zbig also secured me access to the tile finds from Ez Zantur, daring to recommend me to the excavation leader, Dr. Bernhard Kolb. I am very grateful for this, and to Dr. Kolb for entrusting me with the material from Ez Zantur IV. More detailed thanks to people involved in actual fieldwork and research can be found in the individual articles.

I have had the pleasure to enjoy research periods both in the Finnish Institute in Rome and the Finnish Institute at Athens. These research institutes are a treasure for Finnish humanistic research internationally, and my gratitude to their competent and helpful staff is immense. They provided me with the necessary possibility to spend time in my research areas and with the materials, and guaranteed access to research infrastructures in their respective locations. The foremost among these have been the research libraries: the institute libraries, The Library at the American Academy in Rome, The Nordic Library in Athens, The Library of the British School at Athens, The Blegen Library of the American School of Classical Studies at Athens. In addition, I have always received excellent support from the Library of the Finnish Heritage Agency and The National Library of Finland, both of which contain a surprisingly extensive collection concerning classical archaeology. This study is dedicated to all these wonderful places, which I hope to be able to visit and use also in the future.

Working on such an exotic topic as roof tiles can be an isolated business, and it has been important to me to use collegial environments for sharing of experiences and knowledge. I have enjoyed finding other researchers

interested in roof tiles and testing our thoughts, so my warm thanks go, among several supportive contacts, to Philip Mills, Elizabeth Murphy and Elena Cuijpers for extended discussions and friendly collegial support. Also my home institution, University of Helsinki has provided much-needed support for a part-time PhD student, be it either through the Doctoral Programme in History and Cultural Heritage, or through more informal peer support that was especially invaluable in the last phases of this work. A major effort in correcting my English and the text of the summary in general was done by Christopher TenWolde and my sister Marjo Somari, and I thank them warmly for their help.

Partially due to the extended duration of the research, several sources have been involved in funding it. I am grateful for the following institutions for making this research possible: Foundation for the Finnish Institute at Athens, The Finnish Cultural Foundation, Finnish Konkordia Foundation, University of Helsinki/CoE 'Ancient Greek written sources', The University of Helsinki/Chancellor's Travel Grants and The University of Helsinki/Graduate School Travel Grants. The final stages of the work were supported by The Employment Fund which allowed me to finalise the work on a leave of absence from the Finnish Heritage Agency.

For almost all of the duration of the research, I have been working at the Finnish Heritage Agency (previously National Board of Antiquities). Since this project basically took two decades, numerous colleagues and superiors have been exposed to my occasional absences and incessant ranting about the importance of roof tiles. Thankfully, everybody has been very supportive towards my research ambitions. The Heritage Agency is a great place to work also for those who have an identity as a researcher.

I'm quite certain that after all this, my friends and family will never want to hear another word about roof tiles, but I wish them to know that their support has been extremely important to me all through this work. They've provided a constant stream of friendly interest and encouragement, which has in part motivated me further. Deep discussions while skiing in Lapland have been illuminating, and Joni owes me a bottle of champagne for this PhD, a bet won and cashed in after over 10 years of suspense. My fellow archaeologists and dear friends, Satu and Sanna, are often in my mind although we meet more seldom than is good for us, and it's mostly my fault. I'm thankful for both my parents and my in-laws and all the related siblings for all their numerous ways of helping, from childcare to financial support, or just being the wonderful people that you are. Most of the daily drudgery, long absences and enforced reading of drafts have been covered by my husband Mika, who has valiantly survived through it all. I promise to try to make the project stacks disappear from our home soon. Our son Juho was born and grew to a teenager during the process, which means he is overly used to a mother who sits by the computer all evenings and holidays. I'm sorry, and I love you all.

This project has given me immense amounts of time for thinking, reasoning and immersing myself in something very unique and specific. It has given me focus and an outlet, provided me with intellectual nourishment and a tranquil space in a world of constant hurry. I hope to continue this in one form or another.

“Niente e nessuno al mondo potrà fermarmi dal ragionare”
– *Lorenzo Cherubini, 1994*

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LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications:

- I Hamari, Pirjo 2017, Tile and brick, in: Karivieri, A. (ed.), *The Early Christian basilica of Arethousa in Macedonia I. Production, consumption and trade*, Papers and monographs of the Finnish Institute at Athens vol. XXIII, Helsinki 2017: 37-89.
- II Hamari, Pirjo, Tsiadaki Despoina, Kazakis Nikolaos, Tsirliganis Nestor 2019, Tracing ancient fingerlines: applying micro-XRF to signatures on ceramic roof tiles in Late Antique Arethousa, Paliambela (Greece), *Journal of Archaeological Science, Reports, Volume 26, August 2019, 101869* (Received 13 October 2018, Revised 19 May 2019, Accepted 22 May 2019, Available online 13 June 2019). <https://doi.org/10.1016/j.jasrep.2019.05.034>
- III Hamari, Pirjo 2008, Tiles and bricks from the Jabal Haroun Monastery, in: Fiema, Z. (ed.), *Petra - the Mountain of Aaron I. The Church and the Chapel*, Societas Scientiarum Fennica, Helsinki 2008: 376-391.
- IV Hamari, Pirjo 2017, The roofscapes of Petra: the use of ceramic roof tiles in a Nabataean-Roman urban context, in: Mills P. and Rajala U. (eds.): *Forms of Dwelling. 20 Years of Taskscapes in Archaeology*, Oxbow Books, Oxford 2017: 85-113.

In Article II, Pirjo Hamari designed the research and selected and took the necessary samples. She contributed to the structure of the paper, wrote the archaeological background information and had a leading role in the Discussion and Conclusion parts. The other authors performed the tests, were responsible for the Method and the Results, and contributed to the rest of the article according to their expertise.

ABBREVIATIONS

CE	common era
BCE	before common era
c.	century
E	east
e.g.	exempli gratia
etc.	et cetera
et al.	et alii
i.a.	inter alia
i.e.	id est
pers. comm	personal communication
N	north
S	south
W	west

1 INTRODUCTION

“Anyone who has excavated the ruins of a building, of classical times and later, that was once covered by a roof of tiles, will remember the hundreds and thousands of shattered pieces invariably encountered; basket after basket is filled with such fragments, and even the most inattentive excavator could not fail to pay some attention to material so abundant and so conspicuous, however fragile and broken it might be.”

– Carl W. Blegen 1945, 39-40

Ceramic roof tiles are generally considered to be one of the most abundant material remains of the Roman Empire, and have been called “*the hardest of ancient artifacts*”.¹ However, despite their omnipresence and the huge production volumes of ceramic roof tiles in Antiquity, research has focused only on specific aspects of this body of material. Tile research has never been a mainstream field, and even those who study the epigraphic stamps on the tiles, one of the best-covered subfields, lament the lack of research into its particulars. Despite this, research in this subfield has been able to provide vital and meaningful results concerning different aspects of ancient societies. In addition, the decorative terracotta elements of the early tile systems have been the focus of previous research. However, the subject matter of both of these fields represents a fraction of the totality of the roof tiles actually used, the majority of which were plain undecorated objects. For these, the commonest type of object in the material record of the Roman world, disproportionately little research is available. Bulk finds from excavations and surveys routinely do not end up in reports or publications, and those that do are few and far between, creating a situation where “*few site analyses [available] ... are anything more than groping in the dark*”.² The overall situation is one of disinterest, leading to a dearth of archaeological studies on plain tiles.

Tiles are simple and plain objects, which can perhaps be seen as the main reason for the absence of synthesizing studies. However, this lack of research is baffling to anyone who has taken a closer look at plain roof tiles. Despite their simplicity, similar research methods as e.g. for pottery are fully applicable to roof tiles, and there is a clear promise of similarly interesting results, as this study aims to show. The ubiquity of the material makes it a suitable source of data for the analysis of economic processes such as production and distribution, and one that is able to shed light on the aspirations of both communities and individuals.³ In order for this material to

¹ Winter 1993, 1.

² Vroom 2003, 49 on Middle Byzantine pottery.

³ Santoro Bianchi 2005, 327; Amari 2007; Lancaster 2015a, 244.

function as a meaningful source category, however, major gaps in the research situation need to be filled. One of the biggest gaps is a functional typology, including dates, regions, and methods for sampling and describing tile finds. Such typologies would be of immense value for this common category of material. Typologies would help us with dating; they would also help answer questions related to trade, economic conditions, and workshop structure.⁴ In addition to absence of an accepted typology, fundamental questions related to e.g. the distribution of types, the production of plain tiles, and crafting processes are lacking,⁵ and this lack is especially keenly felt in the eastern parts of the Roman Empire.

The main aim of this research is to clarify the general state of roof tile use in the eastern part of the Mediterranean during the Roman period. It draws on materials studied from three different sites within this area, all consisting of plain tiles, the simplest form of fired roof tiles, and uses them as case studies from which to draw wider conclusions on the state of tiling in the area. The focus of this study has been strongly influenced by questions that arose when looking across wider areas and regions at different types of tiles, in a situation where generic categorizations of tiles persisted and a typology was not available. More than looking at any single site or area, this study is interested in making connections and comparisons between different areas, and in following the diffusion and transmission of forms and traditions in tile making.

The period under study is generally the time of the Roman imperial domination in the East. The area of the research covers the provinces and client states of the Roman Empire east of the Balkans, extending from Roman Greece to Roman Near East. The general timeframe of the study extends from the 1st century CE to 6th century CE, but there are regional differences in the usage of dating brackets in the area under study. The Roman period in Greece can be considered to start already before the CE; Bintliff uses a periodisation from the Late Hellenistic to Early Roman Era (ca. 200 BCE to 200 CE), Middle to Late Roman Period (ca. 200 CE to ca. 650 CE), and Early Byzantine Era (ca. 650 CE to 842 CE) for Greek archaeology;⁶ the publication for Paliambela uses the convention of the Early Byzantine period, starting from the reign of Justinian I (Article I, 38). In the Near East, varying dating brackets are used in different areas and for different contexts; for this research, the overall brackets for the Nabataean to Roman pottery chronology for the Petra area, applied in the Aaron regional survey, are used.⁷

⁴ Skoog 1998, 152; Lancaster 2015a.

⁵ Theocharidou 1988, 97.

⁶ Bintliff 2012, 6.

⁷ One regional example is given by Butcher 2003, 9; the chronology followed here is from Silvonon 2013, 130: Nabataean (1st c. BCE to early 2nd c. CE); Late Roman (mid-2nd c. CE to 3rd c. CE), Early Byzantine (4th to 5th c. CE) and Late Byzantine (6th to early 7th c. CE).

This research had its beginnings in the abundant roof tile material found during the excavations of the Early Christian church at Paliambela in northern Greece in the early 2000's. The excavation director, Dr. Arja Karivieri, had invited me to do a standard contribution to the excavation publication on the roof tile material found at the site, which over the years developed into a more comprehensive research article (Article I). By agreeing to this, I started my journey towards the formation of this thesis. Eventually, other tile assemblages were added to my "portfolio". By looking at these different materials and areas, and by getting to better know the types of tiles used in each specific context, I started to question the current state of research to the extent that a thesis addressing the aforementioned issues felt like the right answer.

The starting point of this broad research plan was that the types of roof tiles used in this area during the Roman period did not resemble the types used in the western provinces. This is a fact that was already established by the early researchers, but which has received curiously little attention overall. Moreover, research in the eastern Mediterranean has been overly complacent in accepting that the original categorization between Corinthian, Laconian, and Hybrid systems of tiling, explained later in this work in more detail, would be self-explanatory enough when it comes to roof tiles in the east. This led first to the issue of the typology of roof tiles in this area, expanding later into questions related to regional groups, to the nature and frequency of use contexts, and to questions related to roof tiles as products of communities, such as methods of production, marks on the tiles, the origins of the clays used, and workshops. All of these aspects are in the end interrelated; e.g. typology is related to workshops and regions; production is related to typology.

Such a research is timely, as over the last decade a new interest has also arisen in plainer ceramic building materials, including roof tiles, manifesting itself in primary research and specialist conferences. Summarizing the results of one such meeting, Lynne Lancaster defined the potential of roof tile research for informing us of the "*role of colonization and urbanization in the transmission of technological knowledge; the importance of trade in bricks and tiles for the spread of new ideas; and the development of new applications and innovative uses of terracotta building elements*".⁸ In addition, a slight change towards the better in the nature and availability of the evidence is also visible in this field, not negligibly by the well-documented assemblages included here, as well as some comparable assemblages and original research. All of this provides the possibility to attempt a synthesizing approach for an area and type of material that has so far mostly remained excluded from such attempts. It is also hoped that the results show the usefulness of careful and holistic documentation, which is normally not applied to plain roof tiles.

⁸ Lancaster 2015a, 238.

This study consists of research carried out on individual sites and assemblages, and the results presented in four articles. The summary is a compilation of key results, as well as a presentation of further conclusions based on the research as a whole, taking on the nature of a review article. The summary consists of a presentation of the field of study and previous research, as well as the aims of the current study, in Chapter 1. Chapter 2 presents the materials and methods used, and sheds light on the more theoretical approaches underpinning the research. Chapter 3 summarises the results that are relevant for the research questions outlined here, and Chapter 4 provides final conclusions and prospects for future research.

1.1 DEFINING THE RESEARCH FRAMEWORK

This chapter briefly describes the research framework and general paradigms within which the current study is situated, and how it positions itself in this field.

The study falls under the general category of classical archaeology, as its subject is the material culture of the “classical” ancient world of the Greek and Roman civilizations.⁹ In a more specific way, the study concerns the Roman period, which is sometimes defined in classical archaeology as a separate subfield, Roman archaeology.¹⁰ Traditionally, the Roman period has not attracted much research interest in the eastern part of the Mediterranean, due to the strong focus on the Greek Archaic, Classical, and Hellenistic periods; most narratives of the Greek past end with the Roman conquest of Greece.¹¹ Roman archaeology in these areas has been slower to develop, and less research has been conducted than in the west, but the situation has developed rapidly over the last decades.¹²

In its traditional form, as a discipline with its roots in art history, classical archaeology has focused largely on monumentality, built heritage, and luxury objects that belonged to the elite layers of society. The last decades have seen an expansion both in methodology and subject matter, which has made the discipline more diverse,¹³ although as such it is still less theoretically inclined than prehistoric archaeology in the western countries.¹⁴ Growing sectors in this field are dedicated to studies on everyday life, broader and more inclusive

⁹ See e.g. Lichenberger and Raja 2017 generally for classical archaeology.

¹⁰ Woolf 2004.

¹¹ Alcock 2002, 36-37.

¹² Sweetman 2012; Petridis 2014.

¹³ Haggis and Antonaccio 2015, 3.

¹⁴ Woolf 2004, 420; for theory-building specifically in materiality, see Gardner 2017.

societal issues, and categories of mass-produced objects. Views have been voiced that it is time to move on from the study of objects and classes of material to a greater diversity of perspectives and methods.¹⁵ On the other hand, some researchers have voiced concerns that too much of the recent research is theoretically led, and misses the necessary connection to the material past and its concrete study.¹⁶ This study does not fully share Alcock and Osborne's view that our knowledge of the material culture of the Greek and Roman world should be sufficiently firmly established.¹⁷ This thesis touches on a category where obvious gaps in knowledge exist. While fully in line with the desire expressed by Alcock and Osborne to move the discourse towards questions about how objects relate to each other and to people, this study underlines how difficult it is to pursue that goal when there are significant gaps in our material-based knowledge.

Within this multifocal field, this study can be classified as materially-focused basic research. Moreover, this is a specialist study, with a narrow focus on one category of material: plain ceramic roof tiles. Due to the nature of the assemblages studied, the closest comparison in research is the field of domestic (plain, kitchen, coarse ware) pottery, utilitarian rather than presentative, and usually simple in form. Pottery and ceramic objects have already been a focus in classical archaeology for a long time, but much of this attention has bypassed plain ware pottery. However, this has been a growing area of research, providing indications where tile research could go and the methods that can be employed, and these indications are visible in the way this research was conducted. This is especially evident as these tiles have not been subject to the practice of stamping, and therefore cannot act as sources for that research area (see discussion in Chapter 1.1). Without such epigraphic markings, the most important source of information is the object itself, and so therefore the comparison to plain pottery becomes more valid. A more theoretical discussion on this aspect of the research is found in Chapter 2.2.

Contrary to the ubiquity of tiles in the material record of the ancient world, only limited information on roof tiles is available from literary sources. The usually reliable source, Vitruvius, writing towards the end of the 1st century BCE on architecture, includes a section on mud bricks ("De Architectura" II.3), making only a passing reference to the kiln-baked bricks which were only used more widely in Rome after the time of his writing.¹⁸ Tiles receive attention only in the general sense of them being used on different parts of buildings,¹⁹ although ceramic roof tiles had been used in Italy for over 600 years by his time. In addition to this, other Greek and Roman literature, legislation, and inscriptions include some chance mentions of tiles, tiled roofs, and

¹⁵ Snodgrass 2007, 17.

¹⁶ Haggis and Antonaccio 2015, 3-4.

¹⁷ Alcock and Osborne 2007, 3.

¹⁸ For the early history of brick use in general, see Gerding 2006; Östborn and Gerding 2015.

¹⁹ Brodribb 1987, 1-2; Hasaki 1999; Kurtzmann 2006, 7-8; Witte 2012.

occupations related to these,²⁰ creating some sense of value and commerce related to tiles. Moreover, the ancient names for earlier roof tile systems from Archaic Greece are known from literary sources (see Ch. 1.2). All of these mentions add some information to our body of knowledge, but what is most crucially missing are texts relating to the material aspects of tile use, such as construction, production, or commission processes.²¹ In a study with such research questions as this one, historical sources are unfortunately of limited utility.

The generally very limited number of specialized studies on the topic (see below) gives this study a part of its character. In many cases, it has been necessary to develop ways of describing, naming, and documenting details connected to tile manufacture and use. One example of this is the still non-standardized terminology related to roof tiles and bricks. The definitions used in this study are explained in more detail in Chapter 1.2, and the related previous research in Chapter 1.3.

1.2 TERMINOLOGY AND DEFINITIONS

“Consistent terminology across the board is still a desideratum in the study of tiles.”

– Eleni Hasaki 1999, 231

Despite individual efforts, there is still a lack of universally used terminology for ceramic roof tiles. Therefore, it is necessary to outline the usage of the terms and definitions followed in the articles. This overview only covers terminology related to tiles as objects; further terminological challenges are related to e.g. production contexts, which cannot be covered in this brief section.²²

The study concerns *ceramic* or *terracotta* roof tiles. As the larger category, they are sometimes classified under *ceramic building materials* (acronym CBM, in French TCA, *terres cuites architecturales*). It is an umbrella term used in archaeology to cover all building materials made from *fired clay*, and particularly used in relation to Roman building materials.²³ This term is in standard use especially in the UK,²⁴ and also makes a sporadic appearance in research literature concerning tiles in other areas. It has not been much used

²⁰ See Orlandos 1966; ancient terminology of bricks also in Gerding 2016.

²¹ Manacorda 2000; Hellmann 2001.

²² On the terminology related to production, see e.g. Murphy and Poblome 2017.

²³ Rook 2013, 63 dislikes the term and calls it “horrid”; it is not its use e.g. in Brodrigg 1987.

²⁴ Archaeological Ceramic Building Materials Group (ACBMG), established in 1999.

in this study, as the umbrella term includes many subcategories (e.g. *bricks*, *wall tiles*, *flue tiles*, *hypocaust elements*, *terracotta decorative elements*) that are not relevant for this study.

The commonest ancient system of tiling a roof with ceramic roof tiles was to use separate *pan tiles* and *cover tiles*. Pan tiles are larger, wider, flat or slightly curving tiles placed on the rafters and facing upwards. Cover tiles are narrower tiles for covering the joints between pan tiles, to create a water- and wind-tight roofing system (Fig. 1). The ridges could additionally be covered with specific *ridge tiles*. A number of other *terracotta decorative elements* could also be present on roofs, such as *antefixes*, *simae*, *terracotta plaques*, and *spouts*. These are usually found in older, more formalized Greek roof systems used in public buildings, and are no longer in use in the period or materials covered by this study.²⁵ The history of early tile systems is summarized in Ch. 3.1.1.

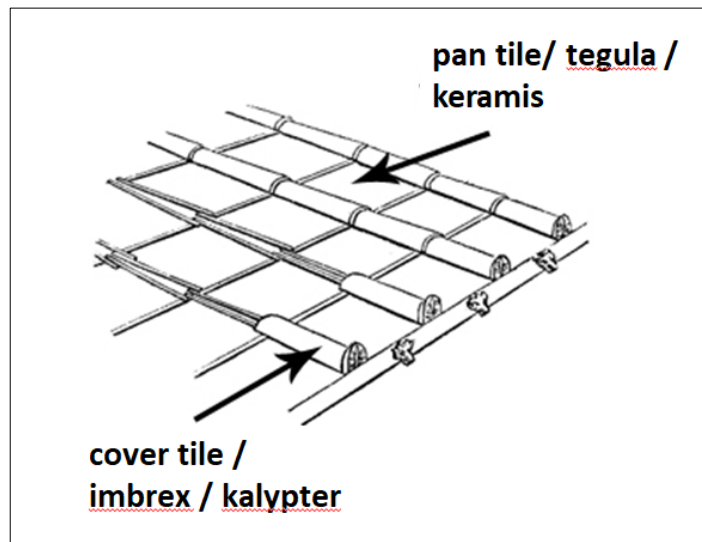


Fig. 1. A schematic presentation of pan and cover tiles. Based on Smith, William. "Tegula". A *Dictionary of Greek and Roman Antiquities*. John Murray, London, 1875. Public domain.

The general Latin terms for roof tiles are *tegula* for pan tile and *imbrex* for cover tile;²⁶ these were in standard use in the west,²⁷ and occasionally in other areas of the empire. In this study, these terms have been reserved for the tiles of the western part of the Empire, in order to distinguish the western and eastern tiling traditions of the Roman world (see discussion in Ch. 3.2). Corresponding terms for pan tile and cover tile can be found in ancient Greek

²⁵ Full descriptions of such decorative terracotta systems can be found in e.g. Winter 1993 and 2009, as well as Wikander 1986, 15, figs. 1-3.

²⁶ See Brodrigg 1987; Ginouves 1992.

²⁷ E.g. Warry 2006b.

terminology (*keramos/keramis*, gr. κέραμος/κέραμις and *kalypter*, gr. καλυπτήρ)²⁸ as defined in the ancient literary sources. However, as they are much more unknown as terms and not in standard use in research²⁹, this study uses the terms *pan tile* and *cover tile* for these two elements of the roofing systems of the eastern traditions.

It is generally accepted that the current tradition of tiled roofs in the Greco-Roman world first emerged in Archaic Greece during the 7th c. BCE. The emergence and dating of the earliest tiled roofs have been discussed in detail, and need not be repeated here.³⁰ The roofs were identified as “systems”, which means that in their original form the roofs consisted of particular combinations of pan tiles, cover tiles, and architectural terracotta decoration. The systems thus recognized are (in order of emergence) the *Protocorinthian* (around 675 BCE),³¹ the *Laconian* (mid-7th to end of 7th cent. BCE),³² and the *Corinthian* (early 6th cent. BCE)³³ systems (Fig. 2), named by Dörpfeld in 1883 based on ancient sources connecting specific buildings to particular tile systems.³⁴ A fourth variant was the *Hybrid* system, combining flat Corinthian-style pan tiles with semi-circular Laconian-style cover tiles,³⁵ named thus by Åkerström to replace the earlier term “*Sicilian*”, which had given an incorrect impression of its diffusion.³⁶ The names “Corinthian” and “Laconian” have become normative in research for denoting Corinthian-derivative flat-panned tiles or Laconian-derivative curved pan tiles. I have followed the convention established by Skoog by using the term *Laconian-style* in describing tiles that are derivatives of the Laconian system proper, and *Corinthian-style* for those combining flat-panned tiles to gabled cover-tiles.³⁷

²⁸ See Ginouves 1992, 182-184; Orlandos 1966, 81-83 and Martin 1965, 72-74 for Greek terminology.

²⁹ See also comments by Hübner 1995.

³⁰ See e.g. Martin 1965, 68-70; Orlandos 1966, 83-89; Skoog 1998; Winter 1993; Sapirstein 2009.

³¹ Sapirstein 2009.

³² Martin 1965, 68; Skoog 1998.

³³ Åkerström 1966, 198; Winter 1993.

³⁴ Wikander 1988, 213; Cooper 1989, 6-7.

³⁵ Åkerström 1966, 195.

³⁶ Wikander 1988, 213.

³⁷ Skoog 1998, 129.

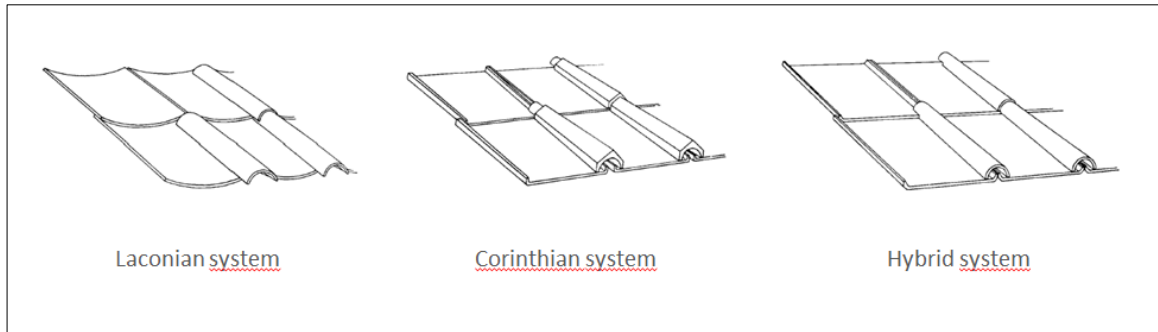


Fig. 2. The Archaic Greek and related roofing systems (Laconian, Corinthian, and Hybrid systems), after Wikander 1988, Fig 6., following Åkerström 1966.

The Roman *tegula* represents the Hybrid form, with flat-panned tiles and semi-circular cover tiles. The genealogy of this type is explained in Chapter 3.1.1. In this context, it is only necessary to note that by the Roman period *tegulae* had developed into quite standardised and uniform objects that shared the same overall features and production methods all across the West, and which moreover significantly differed from the tiles in the East. The terminology related to their components is well established, and can be referred to when describing tile components in general (Fig. 3).

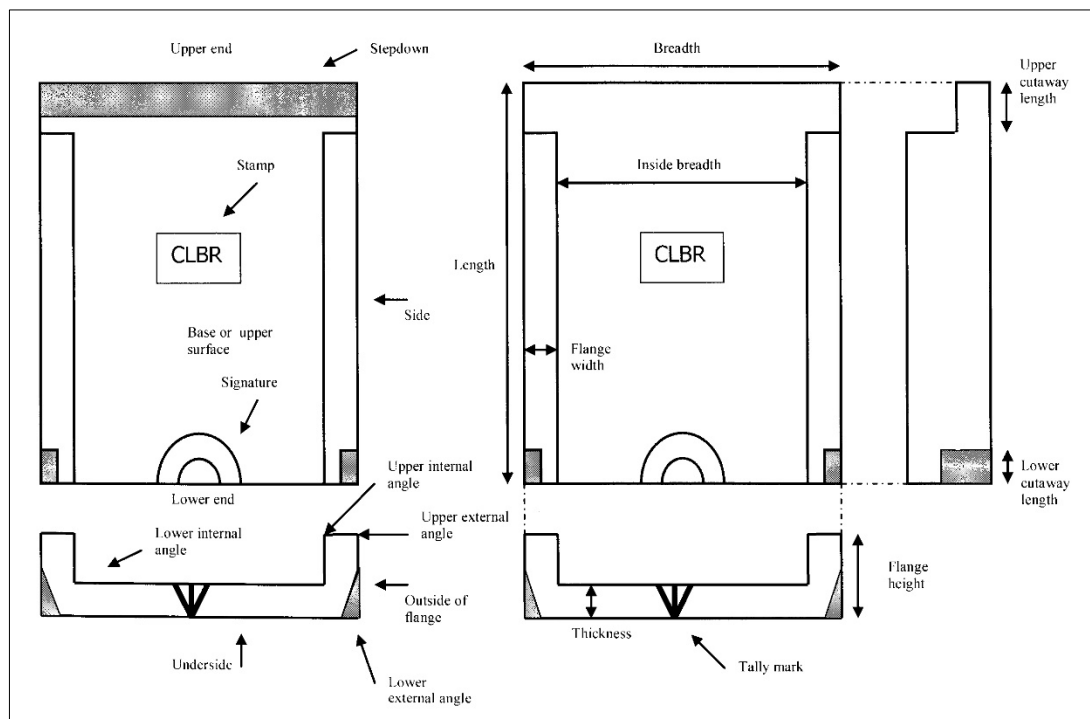


Fig. 3. General form of a *tegula* tile and the standard terminology of the components, after Warry 2006a, Figure 1.1.

The terms for the specific components of the pan tiles have been used in this research as follows. The majority of Greek and Roman pan roof tiles were *rectangular*, or rectangular with slight *tapering*, narrowing towards one short end. The *profile* of the tile means the cross-section across the width of the pan, which in the case of Corinthian pan tiles was *flat*, and in the case of Laconian pan tiles *curved* or *concave*. Tiles could usually be placed only in one direction, leading to one end of the tile being the *upper short end* and the other being the *lower short end*. It was necessary to know which end was which, as the upper row had to *overlap* the lower tile row in order for the roof to be watertight. The correct placement also required that an *upper surface* and a *lower surface/underside* could be discerned, with the upper surface usually being smoothed to be impregnable to weather. The raised borders along the long sides are referred to as *flanges*, as is the common practice in research.³⁸

The cover tiles of the systems were very regular in their morphology, being either *semi-circular* or *faceted/gabled* in profile (Fig. 2), with a long tapering shape. In some cases, however not included in this material, there is a stronger tapering at the narrower (upper) end of the cover tile, called a *shoulder* or a *depressed flange*.³⁹

An element central in the research of Roman tiles in the West are the cuts made to the upper and lower corners of the tiles to facilitate interlocking. These are called *upper cutaways* and *lower cutaways* (Fig. 3).⁴⁰ Shepherd provides the equivalent terms for the Italian area: *con incasso* and *con risega* for the different types of lower cutaways,⁴¹ which are noted here as they have relevance in the discussions related to typologies.

In addition to the already mentioned components, tiles also carry a number of other features, deliberate or accidental, as a result of the manufacturing process. Such traces include *stamps*, where the unfired clay surface is marked with a wooden, metal, or clay stamp by pressing. In Greece, it is also customary to regard as stamps figures that were made on the surfaces of bricks by using a *mould* with a carved bottom, resulting in a relief figure on the surface. These are referred to in articles as *stamps in relief*, but they do not exist in tiles in this material, only on bricks.⁴² *Signatures* are central to this thesis, and will be discussed in detail later. As a definition, they are deliberate non-alphabetic figures made on the surface of the wet tile with fingers, before firing.⁴³ The distinction between a stamp and a signature is not always clear;

³⁸ A schema for roof tile components is given in Winter 1993, frontispiece; however, contrary to the common usage, she calls the semi-cut front short end of the tile a flange. It may have been Winter's intention to formalize and clarify the use of terminology thus, but based on later publications, this use of the term "flange" has not been adopted.

³⁹ Wikander 1988.

⁴⁰ Warry 2006a, 3.

⁴¹ Shepherd 2007; idem 2015.

⁴² See however Huffstot 1987, 280 for an example of a relief-stamped cover tile from Cyprus.

⁴³ Brodribb 1987, 99.

for example, Gerolimou has included in her study of the stamped tiles and bricks of Nikopolis a number of finger-drawn letters as stamps, but has not included non-epigraphic signature figures in her catalogue, although they are present in the find material.⁴⁴ This seems a reasonable division in the light of her aims and the results of this work.

Other marks that could be deliberately made on wet tile surfaces include *graffiti* and *tally marks*. Graffiti could be writing, numerals, or images.⁴⁵ Graffiti on tiles is more commonly made to an already fired and hard surface with a sharp implement; such markings are present in this material (Article I, 58). *Tally marks*, short lines meant for counting on the sides of the tiles, are not present in this material, but are sometimes found on Roman-period tiles.⁴⁶

The production process also left some markings on tiles. A customary tool in tile and brick production is a *frame mould*. In the case of bricks, these were simple wooden square or rectangular frames, with or without bottom. *Tegulae* were also manufactured with the help of wooden or metallic frame moulds. Using moulds with bottoms, into which the material was pressed, could also result in *mould marks*, such as those that are present in the Paliambela material (Article I), usually in the form of thin lines on either surfaces. A *slip* means a coating of a thin layer of water-diluted clay applied to the surface of the tiles.

Although this study concerns roof tiles, in the context of ceramic building materials it is important to make a terminological distinction between tiles and *bricks*. Generally, and specifically in this work, brick refers to building ceramics, usually square or rectangular, that were meant for wall construction, but can also include circular hypocaust bricks and other wall or floor bricks. The Latin and Greek terms for these are commonly used in research; of these, *bessales* and *bipedales*, more or less in standard use and based on Roman metrology, are the most frequent.⁴⁷

The terms tile and brick are not always used in a consistent manner in research; in particular, the term tile is sometimes used to mean both brick and tile.⁴⁸ However, from the point of view of this study, it is important to use these terms separately and in a consistent manner.

1.3 PREVIOUS RESEARCH

As already stated, plain roof tiles are a relatively sparsely researched material. Articles I, II, III, and especially IV already clarify parts of the previous research on plain roof tiles. This chapter provides slightly more background on the

⁴⁴ Gerolimou 2014, 282-283.

⁴⁵ Charlier 2004.

⁴⁶ Brodribb 1987, 131.

⁴⁷ Brodribb 1987; Adam 1994.

⁴⁸ See also Gerding 2016.

research that is most relevant in the context of this study, e.g. plain tiles of the Roman period. It includes especially those instances where the research adds to the knowledge regarding typology; in practice, this means publications which discuss and/or document the tiles as complete objects or types in a sufficiently detailed manner (see Chapter 1.3 for discussion).

It is necessary to start the description of the status of previous research from the western part of the Roman Empire as a regional focus, and from the practice of stamping as a field of study. It is clear that, for the Roman period, the majority of research on roof tiles concerns assemblages and the habit of tiling in the western part of the Empire. Moreover, it is in general focused on decorative terracotta on one hand, and on tile stamps on the other, at the cost of plain tiles as objects.⁴⁹ Studies concerning plain tiles of the Roman period are few, and more crucially are dispersed amongst a vast amount of research and grey literature. On the whole, there is only a very limited pool of comparative published examples from which to draw comparisons. For the purposes of the research included in the articles, an attempt has been made to locate all relevant published examples. The material does not claim completeness, but is representative of a substantial sample of published tile finds in this area.

Articles (I-IV) contain more extensive references to relevant research for each area, and only a selection of trends and the most relevant publications are provided here.

Research in the West

In Italy, a large part of the history of tile research is related to the study of stamping.⁵⁰ Since the publication of the *Corpus Inscriptionum Latinarum* XV,1 by Dressel in 1891 and the accompanying *Supplementum* by Bloch in 1949 on *instrumentum domesticum*, research on the practice of stamping and its variants has been steadily accumulating. Many fundamental studies were published by the Finnish research group working with the brick stamps of Ostia,⁵¹ especially by E.M. Steinby.⁵²

Although the results of research on tile stamps are immensely valuable and impressive, the unfortunate side effect has been that plain tiles are considered of little value in comparison to stamped examples and remain less studied. An additional complication is that the documentation of stamped

⁴⁹ Wikander 1988, 203.

⁵⁰ Overviews of research related to tile stamping can be found e.g. in Manacorda 2000, Bruun 2005, and Gerolimou 2014.

⁵¹ E.g. Helen 1975; Setälä 1977; Steinby 1978.

⁵² E.g. Steinby 1977, 1993.

examples does not usually cover the documentation of the carrier (tile), at least not to a degree which would support the assessment of the types of the tiles.⁵³

An early and important exception to the lack of research on plain tiles is Margareta Steinby's contribution on the roof tiles of Santa Maria Maggiore.⁵⁴ In this seminal study she, in addition to making a considerable contribution to the research of brick stamps in Rome, also documented and discussed the typology of the roof tiles as objects – a possibility offered by the good state of preservation of the tiles. Steinby's work has been the foundation for later studies of plain tiles in Italy, in which area the principal research has been made by Elizabeth Jane Shepherd. Her work has demonstrated the possibility of the creation of plain tile typologies (in the case of Italy, based on corner cut-outs, see also Fig. 10b), and how these contribute e.g. to diffusion of tile technologies in the West.⁵⁵

Another area where progress has been made concerns pre-Imperial tile use and production in Italy, starting from the Archaic period. Although having a strong focus on decorated terracottas, this research is important when looking at the regional development of types and styles. Its main proponents in Italy have been Örjan Wikander⁵⁶ and Nancy Winter.⁵⁷ In particular, Wikander's typology of central Italian tiles before the 2nd c. BCE is an important piece of research for earlier plain tiles in Italy.⁵⁸

More generally, research in the western provinces of the Empire has produced and continues to produce a steady amount of research on roof tiles, again with a strong focus on stamping. One strong area of research has been the area of Roman Britain. There, the real start of plain roof tiles research was heralded by the 1979 conference and subsequent publication of "Roman brick and tile",⁵⁹ and a little later, by Gerald Brodrigg's similarly named monograph,⁶⁰ both looking at tile and brick production from many angles, with a focus on the British materials. In more recent years, the work of Peter Warry in particular has expanded the understanding of Roman tiles in Britain. Warry has, amongst other findings, demonstrated that *tegula* cut-outs follow a datable typological development.⁶¹ The British studies are mirrored to a degree in the growing number of studies in other western provinces. Especially important in light of this study is the analysis done by Benjamin

⁵³ This latter issue has recently been addressed (Bianchi and Martini 2015) and examples of good documentation practices for complete tiles exist (Berg 2010, 466, Fig. 1).

⁵⁴ Steinby 1973-74.

⁵⁵ Shepherd 2007 and 2015.

⁵⁶ Wikander 1986 and 2017.

⁵⁷ Winter 2009.

⁵⁸ Wikander 1993.

⁵⁹ McWhirr 1979.

⁶⁰ Brodrigg 1987.

⁶¹ Warry 2006a and 2006b.

Clément on the typology of plain Gallo-Roman tiles, indicating similar results to Warry but specific to E Gaul.⁶²

Related research in the provinces can also be found in studies concerning legionary tile stamping and tile use along the whole of the Roman frontier.⁶³ This research has the usual focus on the habit of stamping, but nevertheless in more marginal areas of the Empire it is of value in indicating the presence of tiles in general. In the same way, research related to wrecks, imports, and maritime transport, indicating at least regional and deliberate trade, has expanded our understanding of the nature of tiles as a commercial product.⁶⁴ Finally, the work done by H. Gerding has focused on the terminology related to brick and tile which is used in ancient literary sources.⁶⁵

Research in the East

If the research on plain roof tiles is not exactly overwhelming in the western provinces of the Roman Empire, in the eastern parts its lack is even more conspicuous. There can be several reasons for such a state, including the strong focus on the early decorative tile systems, the limited amount of stamping in the eastern part of the Empire, and the sometimes problematic status of Roman-period archaeology in these areas (see discussion in Chapter 1.1). Some general trends are outlined below, first for the Greek areas and further on for the Near Eastern parts of the Empire. A summary of research on the earlier tile systems, mainly in Greece and Asia Minor, has been compiled by G. Hübner.⁶⁶

Due to the origin of the practice of tiling in Archaic Greece, a natural area of research on roof tiles in the East has been the origin of the tradition of ceramic roof tiles and the development of the main systems and their decorative components. Early research identified the mentioned tiles in 1881, based on tiles from Olympia and elsewhere in Greece.⁶⁷ A general look at the development of these systems can be found e.g. in Winter for earlier and Badie and Billot for later periods.⁶⁸ For the early Laconian system, a comprehensive study has been made by Skoog;⁶⁹ a similar study of the Corinthian system has recently been made by Sapirstein.⁷⁰ Areas further afield, including also Asia

⁶² Clément 2013. Comparable research from other regions of the francophone area include e.g. Nauleau 2013.

⁶³ E.g. Kurzmann 2006.

⁶⁴ Parker 1992; 2008; Mills 2013; Lancaster 2015a.

⁶⁵ Gerding 2016.

⁶⁶ Hübner 1997.

⁶⁷ Dörpfeld 1881; Wikander 1988, 203; Hübner 1997.

⁶⁸ Winter 1993; Badie and Billot 2001.

⁶⁹ Skoog 1998.

⁷⁰ Sapirstein 2008 and 2009.

Minor, were covered by Åkerström's contribution, which is one of the larger overviews of early tiling in the East.⁷¹ As usual for the time, however, he concentrated on decorative terracotta elements and bypassed plain tiles,⁷² and additionally limited his study to the early periods, excluding the Roman. Wikander has also contributed more generally to tile studies in the East with his seminal publication "Ancient roof-tile – use and function",⁷³ the still often-cited work that outlines the development of plain tile types in the Mediterranean. Both Åkerström and Wikander describe the general distributions of different tile systems, although based on the rather limited material at disposal at that time. For our purposes, it is most notable that this research mainly concerns periods earlier than the Roman.

There are no epigraphic stamps in the tile material currently studied, and therefore the research related to this area in the East is not summarized here. However, due to the proximity of the regions and timeframe, as well as the usefulness and comprehensive nature of the work, a specific note is made of the recent study by Konstantina Gerolimou on the stamped tiles and bricks from Nikopolis in Epirus,⁷⁴ where much of the recent research relating to the practice of stamping in Greece and the East is summarised.

Outside of early, decorative, or stamped roof tiles, the research related to Roman-period plain roof tiles of the eastern part of the Mediterranean remains extremely limited and of local nature. It is defined by some single studies with a more comprehensive approach, and a number of small publications from the more progressive research projects. The vast majority of published examples are however limited to the mention that roof tiles were encountered during the excavation. Every single researcher that has taken up a wider study of plain roof tiles shares the observation of how under-researched and under-published this category of materials is.⁷⁵

This summary chapter outlines some of the most relevant studies of Roman-period plain roof tiles from the eastern part of the Mediterranean; many of the smaller site-specific studies are excluded, as the references can be found in the articles included (I-IV). Concerning the Greek area, the most comprehensive study concerns the roof tiles found in the survey of Sikyon in the Peloponnese.⁷⁶ There are specific sections concerning tiles in some of the larger surveys,⁷⁷ and some excavations have also published their tile finds more extensively.⁷⁸ Concerning tile production, the work of Kalliopi

⁷¹ Åkerström 1966.

⁷² See Busching 2013, 5 and Hübner 1997 for comments.

⁷³ Wikander 1988.

⁷⁴ Gerolimou 2014.

⁷⁵ E.g. Hübner 1997; Hasaki 1999, 226; Witte 2012, 297; Mills 2013; Shepherd 2015, 120.

⁷⁶ Koskinas 2011.

⁷⁷ Berbati: Wells and Runnels 1996; Laconia: Cavanagh *et al.* 1996.

⁷⁸ Aliko: Sodini and Kolokotsas 1984; Pyrgouthi: Hjolman 2005; Corinth: Bookidis and Stroud 1997.

Theocharidou on Early Byzantine brick and tile production in Greece is a key piece of research.⁷⁹

For the areas east of Greece a similar situation prevails, although in general the amount of research diminishes even further when moving eastwards. In Cyprus, a number of studies have looked at plain tiles of the Roman period,⁸⁰ with the most thorough being connected to the site of Kalavassos-Kopetra.⁸¹ In Asia Minor, the more extensively published sites and regions include Miletos,⁸² Labraunda,⁸³ Amorium,⁸⁴ and Sagalassos,⁸⁵ although due to the focus area of the study the status of published examples of tiles from Asia Minor and N Levant is not as extensively researched as those from Greece and S Levant.

Publications concerning any kind of Roman-period tiles (decorated, stamped, or plain) from Anatolia eastwards are very rare. Again, due to the focus of the research, the area that is best covered in the search for related published material is Jordan, but relevant key studies from neighbouring areas should be included in the research and referenced in the articles. Mills' study is a stand-alone larger work focussing on ceramic building material trade in Carthage and Beirut,⁸⁶ and contributes on a large scale to the research on roof tiles in the eastern Mediterranean. His work aims to analyse the trade of roof tiles based on the assemblages included, and its primary focus is on establishing provenance through fabrics. Mills' work, and subsequent related publications,⁸⁷ are rare examples of research with a focus solely on roof tiles, but they approach the issue from a different angle than the current work. The utility of Mills' work for typology is not extensive, as his work concentrates on fabrics and trade, a fact that is also clearly outlined in his own research.⁸⁸ In addition, some site and survey studies including tile finds are available from N Levant.⁸⁹

The S Levant and Jordan have not seen any more research than the Roman Near East in general. One rare example from Jordan of a published assemblage concerns the Early Byzantine tiles from Umm Qeis/Gadara,⁹⁰ and a number of articles from Israel consider legionary and civilian tiles from especially

⁷⁹ Theocharidou 1988.

⁸⁰ E.g. Huffstot 1987.

⁸¹ Rautmann 2003.

⁸² Berndt 2003.

⁸³ Blid 2012.

⁸⁴ Witte 2012.

⁸⁵ Loots *et al.* 2002.

⁸⁶ Mills 2013.

⁸⁷ Mills 2015a; Mills 2015b.

⁸⁸ Mills 2005.

⁸⁹ See e.g. Newson *et al.* 2010.

⁹⁰ Vriezen 1995; Vriezen *et al.* 1997.

around the Jerusalem region.⁹¹ Finally, some recent research in S Jordan, at Humayma, has started to enlarge the picture of ceramic building materials in the area.⁹² Even Petra, an important city that has been the focus of research for over a decade, lacks previous studies on roof tiles, for which articles III and IV are the first comprehensive ones, excepting some individual examples of finds briefly published. However, some architectural works on Petra, foremost by Rababeh and Kanellopoulos, include tile roofing as a component in construction in their general analysis.⁹³

In addition to publications describing assemblages and discussing tile types, a short note on research related to the scientific analysis of tiles is in order. This research is summarised in Article II, but it can be reiterated here that some archaeometric analyses have been performed on tiles, but considerably less than e.g. on pottery – this is relative to the general interest in tiles.⁹⁴ The few studies carried out, however, demonstrate that compositional and petrographic analyses are viable for this material, just as they are for other categories of coarseware ceramics, such as amphorae. These studies have mostly focused on provenance- and technology-related research questions. A further discussion on the methodology can be found in Ch. 2.2.3 of this summary.

Finally, some general works on the transmission of Roman architectural traditions related to ceramic building materials in the area have been useful for this work, mainly concerning brick, and techniques such as vaulting.⁹⁵ These provide useful examples of technological exchange models and means of diffusion, impact, and the surpassing of traditional boundaries between east and west. In addition, a growing interest has recently led to the sharing of experiences and expertise in the general area of tile and brick, resulting in workshops and conferences related to the study of ceramic building materials, foremost of which have been the three “Lateres” workshops in 2014, 2016, and 2019, and the resulting publications.⁹⁶

* * *

In summary, the western part of the Roman Empire has received a number of specialist studies of research concerning plain tiles, showing that there is considerable potential in this material for extracting meaningful information, e.g. in terms of regional typologies based on morphological features. In

⁹¹ E.g. Arubas and Goldfus 1995; Seligman 2015; Tepper *et al.* 2016.

⁹² Reeves and Harvey 2016; Ebeling *forthc.*

⁹³ Kanellopoulos 2001 and 2004; Rababeh 2005; *idem.* 2016.

⁹⁴ For some relevant examples, see Kilikoglou *et al.* 1988; Raumann *et al.* 1999; Giacomini 2005; Finlay *et al.* 2012; and Weaver *et al.* 2013, with references.

⁹⁵ Dodge 1987; Vitti M 2010; Lancaster 2015b; Vitti 2016.

⁹⁶ Bukowiecki *et al.* 2015; Bonetto *et al.* 2019.

contrast, no such summarizing studies have been made in the eastern part of the Empire, where the overall amount of research on plain tiles is also much lower. The situation with stamped or decorative products as well as the early tile types is known relatively well in the East, but the plainer the products and later the period, the less research and published examples there is available. Even taking into account how tile as a part of the archaeological assemblages becomes rarer towards the East, this means that most of the material discovered in surveys, and especially excavations, remains unstudied, let alone unpublished.

Despite the advances in the study of decorative terracotta and early tile systems, and despite the fact that the regional nature of these has been pointed out by key researchers,⁹⁷ research on plain roof tiles in the eastern part of the Roman world remains stuck on the general lines set out by early research. These lines were based on the recognition of the two main systems of roofing (Laconian/Corinthian), which have come to dominate the categorization of tile finds to the extent that all subsequent finds are summarily placed under these generalised categories. Very often, general works like Orlandos (1966) or Wikander (1988) are referred to when assigning finds to any typological categories. This generalising tendency is reinforced by the usually schematic reconstructions of tiled roofs available in architectural overviews (see e.g. Fig. 2), which is not in line with the existing temporally significant typological and morphological variability of the material itself. This aspect is especially discussed in Ch. 3.2.

1.4 AIMS OF THE CURRENT STUDY

The current study aims at shedding new light on the plain roof tiles in the eastern part of the Mediterranean during the Roman period. In doing so, it moves in many of the areas identified in the previous chapter as ones where little research has previously taken place, such as the greater variability and regional diversity of the tile types produced and used in the east. Research questions related to these lacunae and outlined in this chapter started to form while analysing the materials from the different sites included in this study, and while reviewing the comparative published research for those analyses. These questions are particularly influenced by the wide area under study, and by the apparent need to highlight regional differences.

Such gaps in a material that is abundant in the archaeological record, yet simple in form, might also suggest that there is little to be studied or information to be gained from a more advanced study. Mentions of the material included in reports repeat words such as “standard”, “unremarkable”, “simple”, and “usual” - tiles are regarded as one of the “less impressive waste

⁹⁷ Winter 1990; Skoog 1998.

materials”.⁹⁸ Therefore, one meta-level question addressed in the research was to assess whether a detailed study of tile assemblages would give added value for the archaeological interpretation of past societies. The research, presented in the four articles included, clearly demonstrates the value of looking more closely at plain tile assemblages. Thus, in addition to covering areas of still limited research and adding generally to our knowledge pool on roof tiles, this study furthermore identifies and brings to light the potential of plain roof tiles as source material.

The following chapters outline the main research questions related jointly to the four articles included in this thesis. Although from different areas and different points of time in the Roman domination of the eastern Mediterranean, the research results and the conclusions that can be drawn from them contribute together to several issues related to plain tiles in the eastern Mediterranean area during the Roman period. These are related to three main themes: the general habit of roof tiling in the area during the Roman period, including the genealogy of the types; the types of roof tiles used in different parts of the area during the Roman period; and the ways and contexts in which roof tiles were produced. These three themes are outlined in more detail in the following chapters.

1.4.1 THE HISTORY AND HABIT OF ROOF TILING IN THE EASTERN PART OF THE MEDITERRANEAN

The first comprehensive question concerns the nature of roof tiles and the habit of roof tiling in the eastern part of the Empire during the Roman period. This question was initially formulated at the start of the research, when it became clear that Roman period roof tiles in the eastern areas of the Empire were nothing like the Roman *tegula*, despite the general premise of the Roman roof tile being the dominant or sole tile type used in the Roman Empire. It was not clear, except to the scholars sorting such material constantly, whether there were differences between east and west when it came to Roman period roof tiles, although this had been indicated in several general studies.⁹⁹ The general reference works on Roman construction only explain *tegula* and its use in the west, which leaves half an empire uncharted for its construction habits in relation to tiles. On the other hand, works on Greek architecture do not usually extend into the Roman period in the area. This leaves a clear gap in the description of Roman construction in general, and the practice of roof tiling in particular, for the Roman period in the east.

On the other hand, the situation in the history of construction in the east is fundamentally different from the western provinces. Whereas in the west, ceramic roof tiles were clearly a Roman invention and entered the material

⁹⁸ Witte 2012; Gerolimou 2014, 69.

⁹⁹ See e.g. Wikander 1988.

culture of the new western provinces along with the expansion of the Roman empire, the eastern provinces of the Roman empire were clearly accustomed to the use of tiles and tiled roofs already well before the Roman conquest. This puts the area under study in a different position than the western parts of the Empire in terms of the diffusion of Roman building practices. What are the states and processes through which the diffusion of tiles proceeds before the Roman period? What is the life history, the genealogy of the Roman period tile in the east? The way in which this habit was formed has clear consequences for understanding the habit in the Roman period.

A further question is related to the commonness and ubiquity of the tiles, their presence in the archaeological landscape. It is commonly assumed that ceramic roof tiles were used in Italy for covering almost all kinds of buildings in their heyday from the 2nd century CE onwards, and this leaves them present in almost all archaeological contexts. This idea is summarized by Ward-Perkins, who evokes the image of even small sheds, at the bottom of the building hierarchy, being covered with tiles, and the landscape littered with their fragments.¹⁰⁰ How is this contextuality played out in the east? We have a general understanding that the more east you go, the less commonly tile was used, but can we say something more precise about the presence of tile in the archaeological record in the east? How is its frequency evidenced, and what were the contexts of tile use in the east? Moreover, given the vast area covered by the eastern part of the Empire, are there regional differences in the presence and use of tile? Increasing our understanding of these topics has consequences for our understanding of archaeological contexts and recognising common and uncommon patterns of tile presence.

A variable in this discussion is the original reason for the adoption of ceramic roof tiles over other materials for roofing in the eastern parts of the Mediterranean. In general, this is linked to increasing monumentalization, and the development or adoption of urban architectural styles, innovative or foreign. However, other variables, such as technical and environmental factors, may also have played a role. Although this research does not directly aim to answer this question, it is an important variable in the general framework and will be discussed as a part of the results.

Research targeting or contributing to these questions are addressed in papers I, III, and IV respectively, and the results summarised in Chapter 3.1.

1.4.2 REGIONAL TYPES AND VARIATION IN ROMAN-PERIOD ROOF TILES IN THE EAST

A natural step forward from the first theme is the second goal: identifying the types of tiles used in the area in the Roman period. The research presented in the articles contains a strong descriptive element of the tiles in the

¹⁰⁰ Ward-Perkins 2005, 95.

assemblages, which quickly led to questions about the categorization and typology of tiles, and which forms the core of the current research. While being engaged with different tile materials from different parts of the eastern Mediterranean, it became clear that the morphology of the tiles was extremely varied. A natural step in this exploration was to look at the earlier categorizations and assess their suitability in the obvious presence of much more variability than was previously assumed. On the other hand, the differences between the western *tegula* and the proposed eastern typologies needs to be considered in more detail.

Previous research on roof tile typology has focused on earlier periods of the area under study, and on the elaborate and decorated tile systems of those periods. For Roman Greece, although it is generally clear that the Classical and Hellenistic tile types continued in more simple and utilitarian versions, it is however less clear in which formats and with what kind of temporal and regional variation. On the other hand, research further in the Roman Near East has been so limited that even the discussion on Roman period tile types in the area has not properly started.

No great expectations exist among researchers that exact typologies could be developed for plain roof tiles, or that plain tile fragments could be more diagnostic in surveys.¹⁰¹ The general assumption is that due to the long lifetime and the wide distribution of the common types of pan and cover tiles, a more precise dating or provenance through categorization would not be possible.¹⁰² Representations are often simple (as in Fig. 3), compressing features to standard and schematic presentations that do not encourage the development of typologies. Another reason for the slow development of typologies are surveys as a major source of material, as the tile fragments encountered in these operations are usually very worn and fragmentary.¹⁰³ Currently, a cycle of dismissal is evident: large quantities of tiles are found, but since there are no usable typologies to help with the handling and extracting of information from the material, they are not tackled. On the other hand, typologies do not develop, since there is no comparative documented material to be used for building them.

However, even if exact typologies, as have been developed for pottery, are not to be expected, even generic but more detailed typologies of tiles would still be very useful for research. Previous studies mentioned before, both for coarseware pottery and plain roof tiles of the western part of the Roman Empire, reinforce the view that a typology of plain roof tiles is possible, if based on a sufficient amount of material analyzed in technical and morphological detail. Are there indications that this would be possible in the eastern part of the Mediterranean during the Roman period? How would such a typology be constructed, and what elements would be important to trace change? Is the

¹⁰¹ See e.g. Lawson 1996; Skoog 1998; Koskinas 2011.

¹⁰² Busching 2013, 5.

¹⁰³ See also comments by Koskinas 2011, 549.

categorization of tiles over long periods of time to Laconian or Corinthian types sufficient? Overall, for all of the eastern Mediterranean, the most crucial question is whether chronologically-bound regional typologies of plain tiles might be possible.

Based on the previous question, it is also interesting to look at the regional similarities or differences in the wider area. Are there regional traditions or tile regions visible in the eastern provinces during the Roman period, and is a step towards establishing more nuanced regional typologies possible?

The core research related to these questions, or supporting conclusions towards these, is presented in papers I, III, and IV respectively, and the results summarised in Chapter 3.2.

1.4.3 CONTEXTS RELATED TO TILE PRODUCTION AND USE IN THE EASTERN PART OF THE ROMAN EMPIRE

Again, connected to the questions related to typology are questions relating to the contexts of tile production and consumption. As there is very little evidence on the ways that ceramic building material production was organised in the east during the Roman period, new evidence towards this would be welcome. Questions relating to production contexts were born both from the desire to find out more about this aspect of the material, as well as from the obvious evidence of the workmanship present in the tile material itself. These questions were studied based on the tile material itself, as no production sites were included in the excavated and studied material.

Roman period tile production in the west is defined by some larger key paradigms: that the production has primarily been local, or at the most regional; that it has been extensive and well-organised, with a marked Imperial interest, especially in Rome and its environs; and that the tile material has potential as evidence on the contexts of production, if studied to the necessary level of detail. Similar questions can be posed in relation to plain tiles in the east. The first question is related to the provenance of the tiles at the sites included in the study, with the paradigm of local production being assessed. Is there something we can say about the provenance of the materials? Secondly, the question of production models for roof tiles is relevant. In particular, the material from Paliambela raised interest in this regard, as will be discussed in Chapter 3.3, but similar questions are also related to early tile production in the Petra area, also discussed in the same Chapter 3.3. The assemblages contained numerous indications of the craft of the tiler, from manufacture processes, to workshop and workforce issues, to technical details of tile making and roof construction. These contribute in general to our knowledge of tile production and use during the Roman period in this area.

Finally, this study looks at the material and its contexts from their human angle, in order to contextualize the research beyond the technical aspects of

the material. Although briefly addressed, this was done first of all to explore the role of the craftsmen in the process of the styling of the tiles. On the other hand, the aim was to assess the role and impact of tiled roofs as part of the architectural landscape they were part of. Both of these questions are examined against the changing political and social environment of the expanding Roman Empire.

Research related to these questions is incorporated in all of the papers, but more direct analysis is to be found in articles II and IV respectively, and is summarised in chapter 3.3.

2 MATERIALS, METHODS, AND THEORETICAL APPROACHES

*No one is going to get excited about the elegance of tegula design.
– John Hefferan, SOAG Bulletin No.62 (2008), 27-30.*

This chapter presents the sites and materials studied in the research, and also outlines the methodological and theoretical background of the study, providing the formal framework on which the results and conclusions are based.

2.1 SITES AND MATERIALS STUDIED

This thesis is based on ceramic roof tile materials of the Roman period from a number of sites from different areas of the eastern Mediterranean. To be precise, the material studied came from three different excavations where roof tiles were discovered. These are summarised in the following chapters as sites and materials. Specific attention is paid here to outlining the documentation and retention processes used at the sites. All materials were personally studied on-site or first-hand, and documented and published by the author, with the full approval of the excavation leaders, research institutions, and national authorities in concordance with national legislation concerning archaeological research and antiquities, as well as following the rules of ethical conduct in research.

The selection of these particular materials and sites was based both on pragmatic and research-based reasons. Exposure to the first assemblage in this thesis, when I participated in the excavations at the site of Paliambela in 2000 and 2001, was what led me to study roof tiles in general. Based on this research, I was offered the opportunity to study the already excavated tile material from another Finnish-affiliated project in Roman East, that from the Monastery of Aaron near Petra in Jordan. By that time my interest in the research questions outlined above, concerning the regional typology in the East and the general contexts of use during the Roman period had already been awakened. This interest was well served by the addition of the third assemblage excavated a decade ago from Ez Zantur in Petra, facilitated by the Finnish research presence in Petra, although not directly related to it. This also provided me the opportunity to focus my research on the earlier, possibly transitional periods of roof tile use in the East.

In addition to the tile assemblages studied, an extensive search was carried out to trace relevant published research, with a necessary focus on the regions closest to the sites. Although this means that a less than thorough search was made in e.g. the Anatolian area and in N and coastal Levant, any gaps remaining in these areas should not be major.

2.1.1 PALIAMBELA IN ARETHOUSA, N GREECE

The tile material from Paliambela in Arethousa is described in detail in articles I and II. Article I presents the main typological description of the Late Antique/Early Byzantine Laconian-style roof tiles and related research used in this thesis. The second article discusses the production models of the tiles from this site, with the help of chemical analysis and the fingerline signatures on the tiles.

The site of Paliambela is situated in N Greece, in the countryside between Thessaloniki and ancient Amphipolis, slightly N of the important east-west road of the Via Egnatia, which connected Rome to Constantinople (Fig. 4a). The material included in this thesis was excavated by the Finnish Institute in Athens from 1999-2002, led by A. Karivieri. The history of the site's discovery and excavation is summarised in the first part of the excavation publication, where a number of specialist studies have also been included.¹⁰⁴ The excavations uncovered a small Early Christian basilica, which was probably constructed in the mid-5th c. CE, surrounded by a not insubstantial settlement. The excavation uncovered parts of the atrium area, as well as the N aisle and baptisterium (Fig. 4b).

¹⁰⁴ Karivieri 2017.

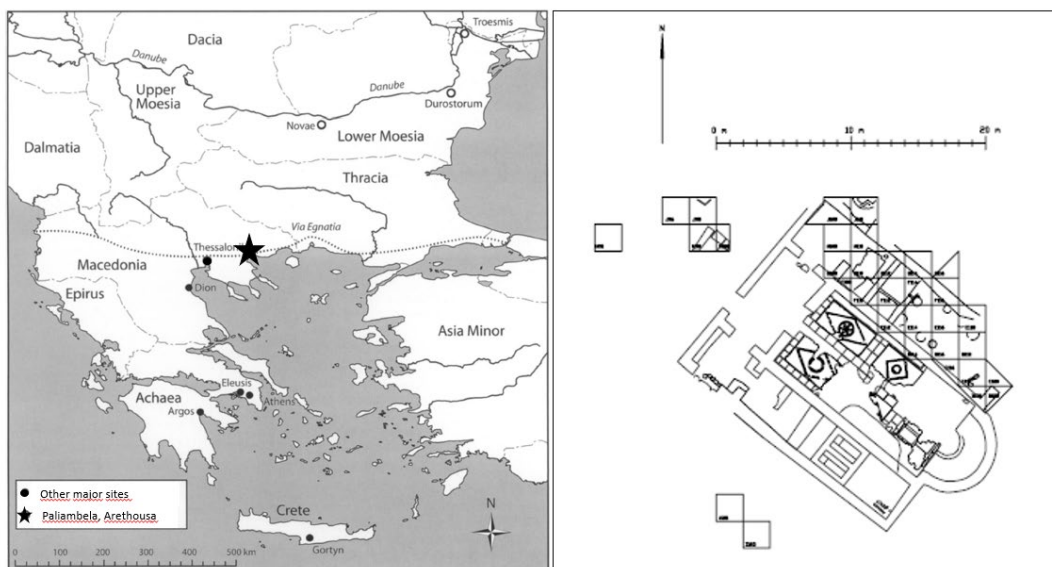


Figure 4a. (left) Map of Roman Greece and the situation of Paliambela in N Greece. After Lancaster 2010, fig. 1.

Figure 4b. (right) Map of the excavated area. Karivieri 2017, fig. 1.

The ceramic building material from the site consists of Laconian-style pan and cover roof tiles, bricks, and miscellaneous other materials, dated to the Late Roman and Early Byzantine periods (3rd c. CE to 6th c. CE). Due to the post-occupation history of the site, there was a destruction layer covering the whole area, consisting mainly of roof tiles, stones, and earth (Fig. 5). During the excavation, all roof tile fragments and bricks were examined. A number of tile and brick fragments, 243 in all, were retained for documentation and included in the publication; they provide a representative sample of the tile types, bricks, and signature figures. The material contains fragments from at least 32 pan tiles and 6 cover tiles, more or less complete (Article I, 38 on documentation).

The retained tile fragments are preserved either in the collections of the Ephorate in Thessaloniki (registered finds), or at the dig house in Vrasna. In addition to the published articles, details of the excavation strata (including the presence of tiles), methods, and areas are recorded in the excavation notebooks preserved in the Ephorate, according to Greek law.



Figure 5. Roof tiles of the destruction layer in the atrium area, waiting for documentation (Squares J96-J98) in Paliambela. Photo Pirjo Hamari, 2000.

The value of this material lies in its good preservation and the well-stratified deposit. The tile stratum represents one simultaneous collapse of an entire roof, providing a good opportunity to assess a closed assemblage. Additionally, the site was apparently quite rapidly covered by accumulated earth, leaving the collapsed layer of tiles nearly intact. Even in areas of abundant tile deposits, such as Roman Greece, such excellent preservation of the material is noteworthy. Complete tiles are usually not encountered except in tile burials, and in these cases they

are not usually documented as objects. The recovered collection is a representative sample of the type of roof tiles that were in use in the Greek mainland around 5th – 6th c. CE, especially those used in the very prolific Early Christian church construction. Specifically, it provides a good basis to study the morphology of Laconian-style pan and cover tiles from a specific time period. In addition, the presence of numerous fingerline signatures on the tiles is noteworthy. Especially because of the opportunity to study these on complete tile surfaces, the assemblage provides a very good basis for research into the signatures.

2.1.2 MONASTERY OF AARON IN PETRA, JORDAN

The tile material from the monastery of Aaron on Jabal Hārūn (Mountain of Aaron) near Petra, Jordan, is described in detail in article III.

The site of the Monastery of Aaron is situated ca. 5 km SW of ancient Petra, on the plateau of the Jabal Hārūn mountain in central Jordan (Fig. 6).¹⁰⁵ The site was excavated by a team from the University of Helsinki from 1997 to

¹⁰⁵ Fiema 2008, 87.

2013, led by J. Frösén and Z. Fiema. The excavation has been extensively published in two volumes,¹⁰⁶ and the accompanying survey of the area in one volume.¹⁰⁷

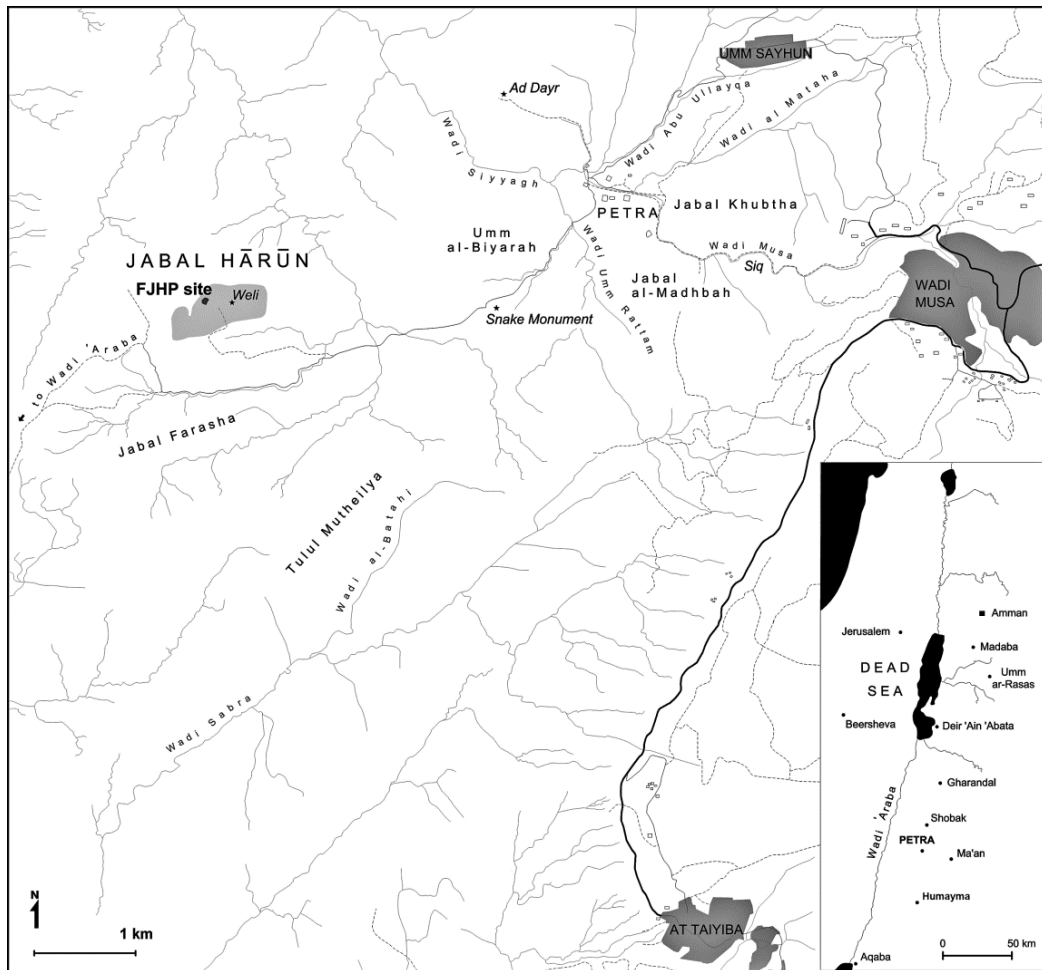


Figure 6. The situation of Petra and Jabal Hārūn in Roman Arabia. From Fiema *et al.* 2016, Fig. 1. Courtesy of FJHP/Z. Fiema.

The excavations revealed a church and monastery complex (Fig. 7), built on a previous Nabataean sanctuary, whose structures were later incorporated into a church and a monastery. The first Early Christian church was built in the 5th century CE, and this is probably the phase in which the tiles were originally used for roofing. The early church was in existence from the mid/late-5th century CE to the early/mid-7th century CE.¹⁰⁸ The site itself continued in use until the 9th-11th c. CE. The material is therefore roughly contemporary with that of Paliambela.

¹⁰⁶ Fiema and Frösén 2008; Fiema *et al.* 2016.

¹⁰⁷ Kouki and Lavento 2013.

¹⁰⁸ See Fiema 2016, 8 for phasing; for the status of the roof, Article III.

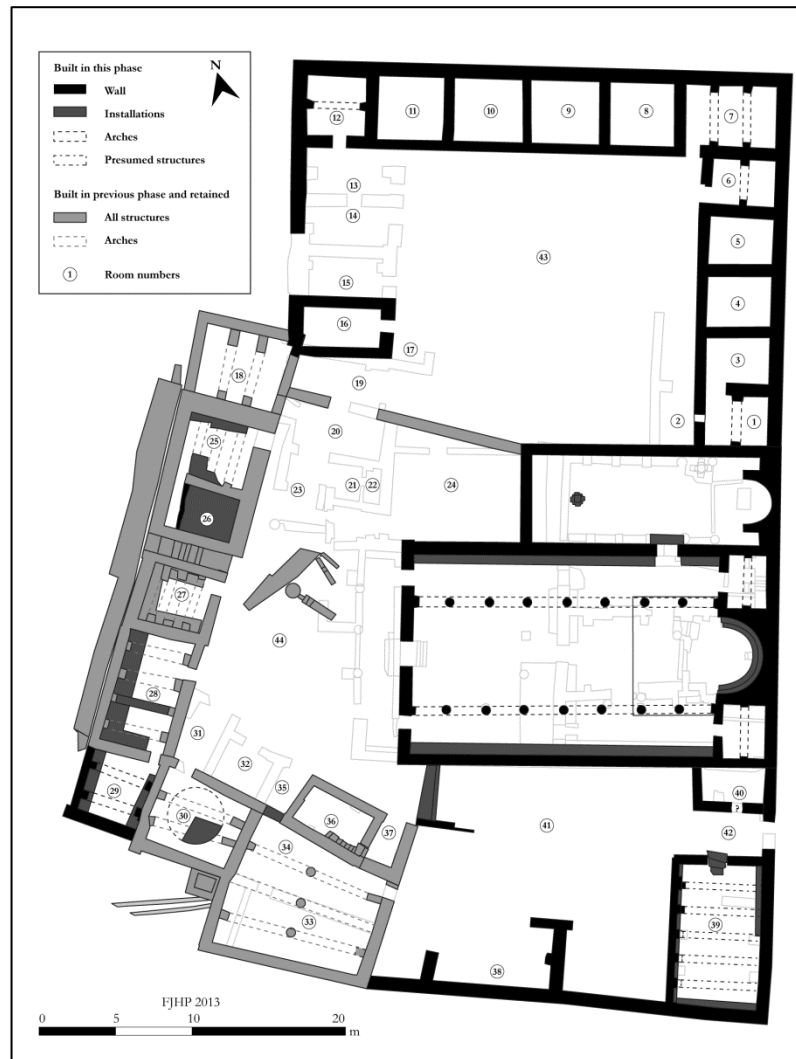


Figure 7. The plan of the monastery in Phase VI (Church/Chapel Phase 2). From Lahelma *et al.* 2016, 592. Courtesy of FJHP/Z. Fiema.

The tiles examined for this thesis come primarily from the church area in the monastery, from secondary deposits, reused in the masonry of the later phases. Contextually they come from the topmost masonry tumble layers. As a result of this re-use, the continued use of the site, and the harsh weather conditions in the area, the material is fragmentary and worn. The tiles are mostly flat, square-flanged, rectangular pan tiles, with semi-circular cover tiles.

The field recording of finds from the excavations is presented in the final excavation publications.¹⁰⁹ In the case of the ceramic building materials, the presence and the count of tiles and brick were recorded on the locus sheets.¹¹⁰ A sample of fragments (146 pieces) that were considered representative,

¹⁰⁹ Fiema 2008 and Fiema 2016, 5-6.

¹¹⁰ Fiema 2016, 6; Article III.

consisting mainly of flange fragments, corners, and marked fragments, were retained and have been published in Article III. Some finds are stored with the registered excavation finds with the antiquities authorities in Jordan, while the rest of the unregistered finds are at the stores of the Finnish Heritage Agency in Helsinki, along with the rest of the excavation finds. These have been deposited in Finland with the permission of the Jordanian authorities.

Despite the secondary find contexts and fragmentary condition of the material, the assemblage has substantial value for tile research. Tile materials in general are rare in the Roman Near East, and this assemblage adds to our understanding of the production and use contexts in this area and period. The tiles from this site are one of the few well-studied and published roof tile assemblages in Jordan, and the first from the Petra area. In addition, this material is valuable because it adds to the typological series of roof tiles in the area, as well as providing evidence on the production and provenance of tiles in this area. Finally, this material is indicative of the same Early Byzantine church-building tradition of the 5th – 6th c. CE as the Paliambela church, and thus contextualizes roof tile finds in this area.

2.1.3 EZ ZANTUR HOUSE IV IN PETRA, JORDAN

Research relating to the tile material from the Ez Zantur House IV in Petra, Jordan is presented in article IV. The full excavation publication of the material is under preparation and not yet finished, but key research results are presented in article IV.

House IV on the hill of Zantur, overlooking central Petra, belongs to the group of large Nabataean-period luxury mansions built in the centre and surrounds of Petra in the early years of the 1st century CE (Fig. 8). It was excavated between 1996 and 2001 under the direction of B. Kolb by the University of Basel team.¹¹¹ The lifetime of the house extends to the later 4th century CE, with possible limited re-use later.

¹¹¹ Kolb 2012.



Figure 8. Plan of the Ez Zantur IV house. The heated winter *triclinium* room (14) is marked out with a star. Courtesy of the EZIV/University of Basel excavation/B. Kolb.

Again, as in the Monastery of Aaron, the tiles, for the most part, were not from primary contexts that would derive from fallen-in roofs, but were used as secondary construction material in the rubble-built walls. Some roof tiles, however, were still *in situ* in the hypocaust room of the house, used as floor tiles (Fig. 9). The material is fragmentary, but due to the different nature of the post-depositional processes, better preserved than in the Monastery of Aaron. The tile material from the house is datable to the 1st c. CE, and possibly even earlier (Article IV, 93).



Figure 9. *In situ* roof tiles used in the floor construction of the winter *triclinium* (Room 14) with a hypocaust. Photo: Pirjo Hamari 2011.

The Swiss excavation team made a locus-based (Fundkontexte) documentation of all excavation *loci*, including the documentation of tile presence, but also retained all excavated fragments. The overall material from the house consisted of 1,057 kg (2,833 items) of tile and brick fragments, out of which approximately 170 items are to be included in the excavation catalogue as reflecting the overall nature of the assemblage. These catalogued finds were retained and stored in the excavation warehouses in Petra. The rest of the finds were discarded after documentation.

The tile material from Ez Zantur IV is interesting and of value for several reasons. One is related to the general rarity of finding tiles in assemblages in this area; all finds are of value in this capacity. This material is the first comprehensively retained and documented tile material from the city of Petra. The second is related to the good documentation policy of the excavation; even a decade after the excavation, a comprehensive picture of the tile assemblage could be reconstructed, including relative frequencies and types present, and will be of value in the final publication. Most interesting, however, is the typological variety of the fragments and their dating, providing information about early roof tile use in Petra.

2.2 METHODOLOGICAL AND THEORETICAL CONSIDERATIONS

This study is based on a series of methods and underlying theoretical frameworks that will be briefly summarised here. This will provide additional context as to how the research was made, and why the questions that were studied were deemed as important.

As a starting point, it should be restated here that, due to the limited nature of previous research, the general nature of this study is closer to basic research than applied research, which also impacts the selection of methods that were suitable or effective. In particular, this study aimed at understanding tiles as objects, and approached this mainly through descriptive typology, although a more technical, compositional approach was used as well. In addition, the study aimed at contextualising the tiles through questions related to use contexts and production. These methodological areas are explained in more detail in the following chapters, before outlining the key results and conclusions of the research.

2.2.1 TILES AS OBJECTS AND ASSEMBLAGES

My study approaches the research of roof tiles (and brick) as we would generally approach all archaeological finds, that is, as complete objects with their individual characteristics defining groups. This differs from the general approach in previous tile-related studies, as it does not concentrate on stamping or decorated elements but rather on plain forms and typology. On the other hand, it does not only analyse tiles through the technical characteristics of the clay pastes used in production, as is commonly done in coarseware pottery studies, when the approach is based on primarily scientific analyses and the focus is on provenance and technology.

As both previous approaches are also valid for tile research, it needs to be underlined that this particular research approach was dictated both by the consideration of the context and characteristics of the sites and materials under study, as well as due to the research interests of the author. One main framework for the study was that all materials included were excavation finds, as opposed to e.g. survey finds, allowing for specific approaches. I believe the approach chosen is an appropriate one given the circumstances of the material and the questions posed, but in other cases other types of frameworks could be used.

This approach comes closer to looking at tiles as objects comparable to pottery, where types and forms have for a long time been the primary focus of study, but where volumes and sherd counts are also commonly used as basic methods. Within this category, coarseware pottery, as it is termed in research, would be the closest comparison group in terms of production processes, and

therefore also methodology. As with roof tiles, they are objects for everyday use, usually locally to semi-locally produced, semi-domestic clay-based fired products requiring moderate but not excessive manufacturing skills, and are common finds in excavations and surveys. In a comparable situation to roof tiles, coarseware pottery was a neglected category of materials which has recently seen an expansion of interest as a field of study, with significant results focusing on morphology, transmission of ideas and technology, and transmission of materials and trade.¹¹² In coarseware pottery studies, this expansion of knowledge has been brought about through careful documentation and the availability of a larger body of evidence, resulting in an ever more deepening understanding of regional types and provenances. This should also be a strong justification towards the necessity of better documentation of tiles as objects in the field of ceramic building materials.

This kind of object-oriented approach understands that the documentation of the items as objects is most useful when it is holistic.¹¹³ As in pottery studies, not only are shapes, types, metrics, and surfaces looked at, but also fabrics and pastes. In this regard, the already mentioned lack of documentation of tile assemblages is evident in many an excavation or survey report and resulting research. Tiles, or ceramic building materials in general, do not usually figure in the typical lists of studied materials; in many cases, it has been deemed sufficient to record the presence or absence of tiles, in order to indicate the presence of a tile-covered structure. In such cases where individual tiles are included, they are a falloff area between pottery and architecture, demonstrating that they have not found a natural place either as objects such as coarseware pottery, or as architectural members such as marble revetments. The approach used in this study has equated them with pottery and other categories of small finds. The Appendix of this summary contains further thoughts on the preferred documentation standards.

In addition to treating tiles as individual objects to be sufficiently well documented, this study regards it as important to study complete assemblages of tile finds (and other ceramic building materials), especially in cases where the assemblages derive from excavations. Conventionally, the term 'assemblage' is applied to a collection of artefacts or ecofacts recovered from a specific archaeological context — a site, an area within a site, a stratified deposit, or a specific feature such as a ditch, tomb, or house,¹¹⁴ and it is this conventional meaning that is used in this work. In practice, this means a cross-cutting look at the tile material in its entirety, that does not overlook plain pieces or dismiss volumetric information. In particular, as in pottery, usually the whole needs to be looked at to understand the value of the assemblage and the individual items it consists of. In the object-oriented approach, which

¹¹² Fulford 2005, v; Joyner 2005, 547. For Greece, see Malamidou 2005; for S Levant, see Gerber 2014.

¹¹³ Buxeda i Garrigós and Madrid i Fernández 2017.

¹¹⁴ Joyce and Pollard 2010.

adopts its methodology from pottery studies, there is value in both types as well as in quantities, volumes, and relative frequencies, which can only be traced when the whole assemblage is considered.¹¹⁵ This has direct implications for documentation and retention practices. These are expanded on in Appendix I; it suffices here to point out that many of the previous successful studies on tile materials rest on careful attention to both object and assemblage.¹¹⁶

The fate of the roof tiles from the earlier excavations in Paliambela is indicative of the standard practice of handling roof tile assemblages. Although the excavation documentation from these excavations was not available for research, some preliminary reports were published by the Greek team. The team excavated the central and southern aisles and the narthex of the church, which were covered with a destruction layer containing roof tiles.¹¹⁷ This was removed to gain access to the underlying strata and the mosaics, as was also done in the later excavation of the atrium area and the N aisle. However, no tiles were documented and retained from that excavation, which covers twice as much area as the later excavations in Paliambela. Compared to what the material from the later excavations has been able to tell us about the church and roof tiles, one cannot but be sorry about the loss of this material.

The excavation methodology described above is in no way an extraordinary circumstance, and sadly cannot be singled out as an exceptionally bad practice going against current archaeological *mores* in the eastern Mediterranean. A similar situation also seems to apply to Petra: the most obvious example there is the Small Temple with its apparently extensive roof collapse (see Article IV, 96). In addition to examples mentioned in Article IV, it is obvious that a large quantity of roof tiles was found during the Great Church excavations,¹¹⁸ however without finding their way into the otherwise very thorough excavation publication. It is one of the intentions of this study to show the interpretive potential of tile as material, which can however only be leveraged with better documentation.

The last note concerning tiles and assemblages relates to tile fragments encountered in surveys. These are usually fragmentary and worn pieces due to the formation processes of survey assemblages. It is a practical reality that this kind of material is hard to use in an approach that focuses on types and objects. However, this is an area where we should not directly accept that the material cannot be accessed with more refined typological tools, and which will hopefully in the future be better integrated into survey methodology and finds analysis as such.¹¹⁹

¹¹⁵ Ikäheimo 2003.

¹¹⁶ E.g. Mills 2013; Clément 2013.

¹¹⁷ Adam-Veleni 2017, 19, gr. *stroma katastrofis*, a term often repeated in excavation reports.

¹¹⁸ See Fiema *et al.* 2001.

¹¹⁹ See Salem 2017 for a first discussion.

2.2.2 CONSIDERING TYPOLOGY AND COMPARATIVE STUDIES

Hand-in-hand with the concept of looking at tiles as objects is viewing typology as a methodology. This study considers paving the way towards regional typologies of roof tiles as one of its key results, and therefore it is in order to briefly clarify the way this concept is understood here. It is not the intention of this summary to theorize over the fundamentals of typological reasoning, but to explain the key concepts that the descriptive part of the work leans on.

Typologies are an old and widely used tool in archaeology.¹²⁰ They are a fundamental way of organizing the material world into understandable segments that help in interpretation, and “puts order into disordered evidence”.¹²¹ Even though typologies are modern academic constructs, and we cannot know how directly they reflect the ancient potter’s or tiler’s realities, the commonly used functional categorizations (e.g. cooking pots, lamps, roof tiles) were most likely also relevant for the ancient people.¹²² In many cases in the ancient world, as is the case with tiles, we also have literary references to terms that can be associated with specific types or styles. These support the modern formation of object categories on typological bases.

Typology rests first of all on the supposition that “like goes with like”,¹²³ on the fact that human tendency is to produce items resembling one another, which have a “style” which varies over time and space in tandem with their associated culture. Thus, the smaller the changes between types are, the closer in space and time we assume their origin to be. Observed similarities in artefact style or execution are used to infer shared social and economic contexts of production.¹²⁴ However, dividing objects into “like goes with like” categories leads only to a classification. Typology exceeds being a purely morphological classification when combined with archaeological information on dating and social context.¹²⁵

Constructing datable typologies first requires contextual dating, but after a sequence has been established it can also be used in relative dating. This is a common way of utilizing pottery in archaeology; it is used to provide dating for the contexts wherein it was found. It is not the intention of this study to dwell more on the potential loopholes already well identified within this paradigm; it is simply to point out that typologies require both attention to forms and attention to dating, both carefully applied, to be useful and

¹²⁰ See Sørensen 2015 for history of typology. As a foot note, in the history of typology, one of the first to be used in archaeology was to distinguish Roman bricks from medieval ones in Britain by John Leland in the 16th century, see Harris 2007.

¹²¹ Bortolini 2017, 651.

¹²² Santacreu *et al.* 2017.

¹²³ Renfrew and Bahn 2004.

¹²⁴ Van Oyen 2015.

¹²⁵ Santacreu *et al.* 2017.

productive models of interpretation. Key success factors are recognizing the features that separate or distinguish, and having a good connection to context and dating.¹²⁶

There are countless examples of utilizing typology in classical archaeology. In the field of pottery, such examples are e.g. black-figure Attic pottery,¹²⁷ or Nabataean fine painted pottery,¹²⁸ both of which have a dated typology with a granularity down to decades and even years. Even though typology is most tempting and easiest to form in high-value objects that display a large number of clearly distinguishable features, simpler objects have also benefited from the development of typologies. Examples closer to plain roof tiles include e.g. transport amphorae and the already mentioned coarseware pottery.¹²⁹

The typologies developed for ancient roof tiles so far are related to the decorated early tiles, and are based on a combination of form and decorative styles. In the Greek world, these took the form of the Corinthian and Laconian systems of roofing (see Ch. 1.2. for a more detailed description). As stated before, these general types have, despite researchers' contributions to highlighting their regional variety, come to dominate our conception of the variability of roof tile types in the eastern part of the Mediterranean, and thus flatten the dimensionality of the material. The granularity of this typology has not been developed much further, especially for the Roman period in the area, and probably remains too general, a fact already pointed out by previous research.¹³⁰

On the other hand, it is not clear, and sometimes even doubted, whether developing typologies for such simple objects as tiles is possible.¹³¹ They are, after all, very simple objects by the Roman period, with few distinguishable features and evidently very traditional and only slowly changing in form. Two main arguments can be presented to justify that a typology for plain tiles would be possible. The first one is that such an approach has already been successfully implemented in amphorae and coarseware pottery; and the second is the fact that we already have dated typologies built on plain roof tiles from the western provinces, as was described in Chapter 1.3. These include e.g. Shepherd's typology of tiles from Italy and Clément's typology of tiles from Gaul.¹³² Both studies demonstrate the difference that detailed observations can make in understanding the dynamics of technology transfer over time, and the varying trajectories taken by individual zones within the same broad

¹²⁶ Adams and Adams 1991.

¹²⁷ Oakley 2009.

¹²⁸ Schmid 2000.

¹²⁹ For coarse ware, see e.g. Berlin 1997; for amphorae, see e.g. Whitbread 1995.

¹³⁰ Hellmann 2002, 298.

¹³¹ Winter 1993, 108; Bushing 2013.

¹³² See Shepherd 2015; Clément 2015; Lancaster 2015a, 238.

region.¹³³ Both authors also emphasise the importance of documentation as a key factor in typology construction.

Typology can in this case be extended only so far, for tiles are simple objects, but neither is there cause to believe that a more detailed and possibly datable typology could not be developed. The approach used in this study was a detailed description of the objects and assemblages and an analysis of their closest comparative types, mindful of chronology and region. C. Gosden calls this genealogy: understanding type formation through its stylistic history, comparable to the tree of human evolution.¹³⁴ The concept is suitable for understanding the slow-changing nature of tile types, although the full theoretical potential of the genealogy framework is not used in this study. However, it underlies the research presented in the articles to a significant degree.

In the research presented in the articles, I have examined which would be the relevant typological factors in the material and tried to put these in their temporal and regional contexts. It should be noted that this direction runs up against the limits imposed by the lack of comparative material very quickly. The limited amount of first-hand material included in the study, and the lack of published comparative materials, means that this study cannot suggest full regional typologies for e.g. Laconian-style tiles in Roman Greece. What it aims to do, however, is to convince that such typologies would be possible, and to provide a first idea of how the typological tile regions in the eastern part of the Roman world could be defined. The only way to refine these preliminary ideas is however to have comparative dated material available for fuller typological seriation.

2.2.3 ARCHAEOMETRIC ANALYSIS AND ITS APPLICABILITY TO TILE RESEARCH

Although the key methodological approach in this research is related to tiles as objects and their morphology, there are methods related to the technical analysis of the tiles that are also relevant and even necessary. It is increasingly clear that details related to clay fabrics and petrology are indispensable in all research related to fired clay objects – in pottery studies, they are a necessary element in understanding typology and groups,¹³⁵ and can be used in determining provenance, production, and trade.¹³⁶ In the descriptive articles presented (article II, III, and partially IV), these elements are presented as the standard fabric descriptions, studied from hand specimens (fresh breaks from

¹³³ Lancaster 2015a, 238.

¹³⁴ Gosden 2005.

¹³⁵ Whitbread 1995; Göransson 2007; Buxeda i Garrigós and Madrid i Fernández 2017.

¹³⁶ Mills 2013.

tile fragments). Guidelines for the documentation of all pottery objects stress the inclusion of the minimum level of technical description.¹³⁷

However, for one specific research question, a more in-depth methodology was chosen. That methods from archaeometry could be used on roof tiles had already been demonstrated by previous studies, preliminarily mentioned in Ch. 1.3. Roof tiles belong to the category of better made simple clay objects, as they need durability and non-permeability to be waterproof. This requires more advanced clay processing methods, such as levigation, clay mixing, and the addition of temper, as well as the application of slip, which consequently renders tiles more suitable for analyses. Tiles and bricks are in this sense closely related to pottery, with which they share a number of technological and material properties.¹³⁸

Of the two main branches of pottery analyses, petrography and chemical composition, this study used chemical composition analysis. More precisely, a micro-pXRF (portable X-ray fluorescence analysis) was used, chosen because it promised to provide answers to a specific research question, that of the interrelation of the fingerline signatures on the tiles in the Paliambela assemblage. This analysis produces a chemical categorization of the samples that can be statistically analysed and grouped. This method turned out to be suitable for this material and to lead to meaningful results, the full analysis of which is presented in Article II. However, as an archaeometric analysis it remains rather limited, and a better result would have been reached by combining it with more detailed compositional analyses, and/or expanding the methodology into e.g. petrography.¹³⁹ However, neither option was available, basically due to the limited amount of funding available for the analyses – a factor that is a reality in many archaeological research projects.

2.2.4 CONTEXTUAL APPROACHES AND STEPS INTO SOCIAL ARCHAEOLOGY

In addition to questions related to tile presence, tile typology, and production, contextualising them to the level of user communities was considered important in the study. Classical archaeology has long focused on monumental remains and architecture, and has only in the last decades broken out of old conventions and broadened its view to include other kinds of questions, such as aspects of social archaeology.¹⁴⁰ As research related to these aspects was not the key question in this research, this area is explored only briefly. However, the theoretical approaches mentioned here have provided some of the

¹³⁷ E.g. Whitbread 1995.

¹³⁸ Quinn 2013, 213.

¹³⁹ As pointed out by Sakalis *et al.* 2017 in the original report.

¹⁴⁰ Hingley 2005; see also Lavan & Bowden 2003 and Swift 2017 for the meaning of artefact studies in social archaeology.

conceptual and informative framework of the study, and therefore are worth mentioning briefly.

The first framework underlying the study is that of change in the material culture of the eastern part of the Mediterranean, with and during the Roman domination. Although the included research does not look at the material specifically from this angle, it remains an underlying temporal and ideological framework. Conceptual and theoretical research related to becoming Roman, or Romanization, the social and material change brought about by the expansion of the Roman Empire, is vast and will not be referenced here; only one observation is in order, and that is that the issue has received less attention in the eastern part of the Roman Empire than in the western provinces.¹⁴¹ For this research, Romanization is not a directly relevant research question, nor is the framework employed as explanatory; how the study is positioned can be best described as coincidental. However, as the study describes objects and their genealogy through the transition into Roman domination in this area, it adds in its way to our understanding of how material culture relates to this change. In particular, it does this in the category of building materials and practices, which in themselves feature commonly in the subject list of studies related to cultural change.¹⁴² In addition, it does this through a material that is low in the hierarchy of value, opening a not-often available window into the process of adjusting to changes on a non-elite level.

A related but separate issue concerns the slow changes of simple objects, and the role that the workshops and craftsmen played in the transfer of ideas and technologies, including in the change of styles. This line of thinking takes its inspiration from the social construction of technology (SCOT), which includes criticism directed towards the linear model of innovation and technological determinism. It differs from these notably in the attention it pays to the influence of the social and technological context of development, which shapes innovation choices.¹⁴³ There is not much in the included articles related to these kinds of thoughts, but much of the interest in production details stems from the wish to understand the mind-sets of craftsmen, to tease out information related to non-technical reasons and processes for style change; and to understand the agency of makers in simple objects.¹⁴⁴

¹⁴¹ See discussion in Woolf 1998, 19 and Hingley 2005, 17.

¹⁴² Lancaster 2015b.

¹⁴³ Duistermaat 2017, 119-120. An article by Elisabeth Murphy & Jeroen Poblome from 2016 was an inspiration (Murphy & Poblome 2016); this is about relationships between aesthetic style, consumption practices and technologies of production.

¹⁴⁴ See e.g. Murphy 2017.

The third approach underpinning the research is related to tiles as parts of the built environment, and the impact of architecture and building. This is closely related to questions of power and agency, concepts increasingly used today in archaeology. The research presented in Article IV benefitted especially from studies related to the means of creation and maintenance of political power and social relationships, and how it was managed in local communities through the material world in buildings for politics, religion, entertainment, and bathing.¹⁴⁵

¹⁴⁵ Grahame 1998; Hingley 2005, 81; Revell 2009, 3, 78–79, 191–193.

3 RESULTS AND DISCUSSION

Previous chapters outlined the aims, materials, and methods of the study. The following chapters summarise the key results from the research presented in the articles, organized according to the research questions that were presented in Chapter 1.4.

3.1 THE HISTORY AND HABIT OF TILING IN THE EAST

The first research question was related to the genealogy of roof tiles and the habit of tiling in the eastern part of the Empire. The conclusions presented in the following chapters, drawn from the research, provide a clearer understanding of the history of tile types and the frequency of tiles in the archaeological landscape, which act as starting points for the later discussion on regional typologies.

3.1.1 ROOF TILE HISTORY BEFORE THE ROMAN PERIOD IN THE EAST

Laying the groundwork for regional typologies starts with painting a clear picture of where the Roman period tiles derive from. This history is summarised here, as the articles were able to provide only a partial picture of the situation. In this regard, there is a fundamental difference to the western provinces: where in the west tiles were a markedly Roman material introduced to the newly conquered areas, in the eastern provinces they were a much earlier phenomenon, a staple of the building industry and a traditional material for covering (at least in some contexts) buildings, with already established systems and traditional components. Although this is a fact that researchers have been familiar with for at least a century, it is worth reviewing here, as it provides such a different setting for the technology transfer and diffusion stage for roof tiles in the east, and has a direct bearing on our understanding of the status of tiling in the Roman period. This review is based on published comparative research on tiles in general, and not directly on my materials.

As the study focuses on other questions than the dates and modes of the diffusion of tiling, and ample literature is available on the subject, there is no need to go into detail on the birth of the technological innovation or its precise diffusion. In the context of this research, three main observations that have a bearing on the upcoming discussion on regional tile typologies should suffice. These are: the conception and nature of the early Greek systems; their later

development in the Greek area; and the spread of the innovation of tiling in the eastern part of the Mediterranean. Some of this general background is already provided in Articles I, III, and IV; this summary will add some further observations on the subject.

Although roof tiles and bricks have a long history as building materials,¹⁴⁶ academic consensus agrees that the current tradition of clay roof tiling starts in Greece in the 8-7th c. BCE.¹⁴⁷ The early tiles were manufactured in specific combinations, called systems, which have been briefly described in Chapter 1.3: the Corinthian and the Laconian. Although the names of the tiling systems are eponymous, it is not clear how strictly regional the systems were. Even when there are regional areas of distribution,¹⁴⁸ there are indications that a more flexible pattern of use possibly existed alongside them. In Delphi, for example, we find one Archaic workshop producing tiles in the Corinthian style, another in the South Italian style, and a third producing tiles in a local Central Greek system.¹⁴⁹ Further, it is evident that the “pure” Laconian and Corinthian systems adapted to the needs of neighbouring regions and were quickly transformed or even adopted in varied forms, such as the regional system in Argos,¹⁵⁰ or the Hybrid system taken up in Asia Minor (see below for discussion).¹⁵¹ Therefore, strictly Laconian and Corinthian systems as such should be understood to mean only a limited group of Archaic tiles, with their specific combination of elements.

A necessary precursor to tracing the history of the roof tile is to map some of the reasons why it was adopted for use in the first place. In case of Archaic, Classical, and Hellenistic Greece, and the eastern Hellenistic areas, its spread is usually linked to the increasing monumentalization and adoption of architectural models suited for monumental structures. For example, the discovery of ceramic roof tiles coincides in Greece with the 7th c. BCE transition to more monumental stone architecture in temple building.¹⁵² At the same time, it is clear that the adoption of ceramic roof tiles needed to be combined with more solid substructures to support the increased weight of the roofs. Some researchers have questioned whether ceramic roof tiles are the effect or the cause in the transition towards more solid architecture, but conclusive evidence one way or the other has not arisen.¹⁵³ However, in addition to the

¹⁴⁶ For the earliest examples of fired building materials (bricks), known from 3rd millennium Mesopotamia see Salonen 1972; pre-Archaic (early Helladic and Mycenaean) tiles are known from Greece (see e.g. Wikander 1988; Winter 1993). According to Sapirstein (2016), it is not probable that a continuity of tradition exists between pre-Archaic and later tiling habits.

¹⁴⁷ Wikander 1988, 204-205; Sapirstein 2016.

¹⁴⁸ Skoog 1988 for Laconian; Winter 1990; Winter 1993.

¹⁴⁹ Winter 1993, 293-296; Skoog 1998, 122.

¹⁵⁰ Winter 1993.

¹⁵¹ Åkerström 1966; Wikander 1988; Skoog 1988, 136.

¹⁵² Sapirstein 2016, 46.

¹⁵³ Clément 2013; Sapirstein 2016, 57.

architectural reasons, functional or environmental variables may also have affected the rate of adoption of tiled roofs. In the Roman period, there are several references to the fireproof nature of tiles, which must have been a real factor in the densely populated urban areas in the Roman Empire.¹⁵⁴ On the other hand, their diffusion can also be related to their impermeability or waterproof nature, which, taking into account the environmental conditions in some parts on the Empire, must have given real advantages over other roofing materials (Article IV). These variables have implications further on, e.g. when discussing the use of roof tiles in different contexts (Chapter 3.1.2).

Research focusing on these early roof tiles in Greece has shown that the systems developed over time, but only slowly. One persisting phenomenon in Greece was the long-term adherence to the basic components of the system, which followed faithfully a combination of either flat pan tiles with gabled cover tiles (Corinthian); or curved pan tiles and semi-circular cover tiles (Laconian); I have not come across any references to hybrid roofing systems in mainland Greece. This consistent following of the “orders” of the tiles has undoubtedly reinforced the view of the standardization and longevity of the tile types.

By their nature, these early tiled roofs were high-investment coverings destined for large public buildings, such as temples and public buildings with larger roof spans, from which contexts they are usually found.¹⁵⁵ The general idea is – and this persists until the Roman period – that the Corinthian was more elaborate, costly, and therefore desirable, whereas the Laconian style was used in minor value contexts, or in cases where resources did not allow for the use on the Corinthian system, and also in domestic contexts.¹⁵⁶

Roofs consisting of these two sets of components continued to be used in Greek construction throughout the Classical and Hellenistic periods. Two elements of change impacted the development: the slow changing of the forms into more simple and utilitarian objects, and the expansion of use contexts. For the use contexts, before the Classical period tiled roofs were placed almost exclusively on monumental buildings, even taking into account the scarce documentation state of domestic architecture from this period.¹⁵⁷ During the Classical period, we see also high-end domestic buildings roofed with either Corinthian- or Laconian-style tiles, although the Corinthian roofing system seems to be generally dominant in all architecture through to the Hellenistic period.¹⁵⁸ However, the real expansion of tile use in Greece occurs during the Hellenistic period, when tiled roofs become more common in domestic building. This turn can be pinpointed to the 4th-3rd centuries BCE. This coincides with, or is caused by, the development of the Laconian-style tiles into

¹⁵⁴ Lancaster 2008, 264.

¹⁵⁵ Sapirstein 2016, 56.

¹⁵⁶ Cooper 1989, 9; Hasaki 1999, n. 22.

¹⁵⁷ Wikander 1988, 205.

¹⁵⁸ Jones *et al.* 1962; Wikander 1988, 213; Hasaki 1999, n. 23; Cavanagh *et al.* 2005, 2.

simpler, more utilitarian styles, making them technically simple and also less costly to make.¹⁵⁹

Although there was a marked expansion in the use contexts of roof tiles in Greece in the Hellenistic period, this level of use should not however be compared to that in the Roman Empire. There is no research available on exactly how much of the urban or rural infrastructure was roofed, and it is not the intention of this study to dwell on this too deeply. In general, tile use becomes more common than in earlier periods, but remains much less than in Imperial Rome. The extent of tile use in the Roman period in this area will be discussed in Chapter 3.1.2.

Regarding the slow change of styles, the current state of research only allows a general overview of the stylistic development of the Laconian- and Corinthian-style systems over time. Although this study did not utilise a series of materials from different periods to look specifically at this long-term stylistic change in Greece, a general understanding, useful for the discussion on regional types in the next chapter, can be presented. It is clear that there is considerable stylistic change in tiles, related to size, surface treatment, and even forms, from the Archaic to the Roman period, although the general forms persist and the established systems continue to be used. This is a very interesting regional and culture-historical phenomenon that would require a more detailed analysis than has been attempted here; for a recent thorough analysis of pre-Roman Greece, the study made by Aristotelis Koskinas on the tile material from the Sikyon survey acts as an excellent overview of the problematics related to this question.¹⁶⁰ There are evident developmental steps in the arc, one of which is the “simplification” from Archaic and Classical tiles to Hellenistic tiles, and the other is the transition from the Hellenistic tile types to the Roman-period types. An extremely interesting period of development falls therefore between the 1st c. BCE and the 2-3rd c. CE, from which we unfortunately have little published tile material, and which is also not covered by my material from Greece. Overall, this means in practice that it is possible to make a relatively easy distinction between Archaic/Classical, Hellenistic, and Roman roof tiles even from smaller fragments.¹⁶¹

Outside Greece, tiled roofs spread from the mainland over most parts of the hellenized world during the second half of the 7th c. BCE. This spread was relatively rapid, which is interesting in itself but cannot be further examined within this summary. Some generalizing trends are outlined below. Another aspect to note is the regional variations adopted in the diffusion of tiling.

Although researchers do not agree on whether tiled roofs in Italy are an independent invention or were introduced by Greek artisans, the use of ceramic roof tiles in this area is almost as old as it is in Greece. The earliest roofs known in Sicily and South and Central Italy are dated ca. 650/625

¹⁵⁹ Skoog 1998, 128.

¹⁶⁰ Koskinas 2011.

¹⁶¹ Koskinas 2011; Salem 2017.

BCE.¹⁶² In the west, the tile systems were adopted from the beginning in the hybrid system, and this forms the model for the future Roman *tegula* as well.¹⁶³ This type is used both in the Etrurian tile area as well as in the S part of Italy, in the Greek colonies; however, in some cases the original systems of the Greek mainland were also used. One example of such a use of the Laconian system from this area has been found in Metapontum, dated to the 4th century.¹⁶⁴ These two areas would later form the core areas of the Roman tile cut-out types.¹⁶⁵ On the other hand, the transmission of influences also worked in the other direction; Archaic Western Greek workshops were also producing tiles in Greece, such as the one operating in Delphi.¹⁶⁶ Shepherd considers the Etrurian tradition as the basis upon which the *tegula* was formed.¹⁶⁷

In the areas E and N of what became the Roman provinces of Achaia, Epirus, and Macedonia (Thracia, Dacia, and Moesia), the Hellenistic traditions of architecture were followed wherever Hellenistic urbanization reached. Both Corinthian- and Laconian-style Hellenistic tiles have been found in these areas.¹⁶⁸ In the cities of the Bosphoros, Corinthian-style tiles were common and Laconian-style tiles rare in the Classical and Hellenistic periods, but this situation was reversed by the Early Christian period.¹⁶⁹ We have little research available on the extent of the tile use in the Classical and Hellenistic periods from these areas, but most likely the situation resembles the Greek one, with urban public building the most prominent context use.

In Asia Minor, ceramic roof tiles were adapted for use very soon after the emergence of the tiling systems in Greece; Åkerström dates this transmission to ca. 600 BC.¹⁷⁰ The adoption was generally in the hybrid format, matching flat Corinthian-style pan tiles with semi-circular cover tiles,¹⁷¹ with the occasional Corinthian system in evidence.¹⁷² The hybrid system became the preferred tile type in the eastern areas,¹⁷³ and by the Hellenistic period it seems to have developed or changed into a more utilitarian form, with simple flat pan tiles with a ridge and semi-circular cover tiles,¹⁷⁴ although there are no comprehensive overviews to support this initial assessment, which is based on

¹⁶² Wikander 1988, 206; Winter 1993. Later research, such as Winter 2009 and Sapirstein 2016, tends to favour the view of a separate tradition in Etruria.

¹⁶³ Winter 1993, 273.

¹⁶⁴ Perugino and Vollaro 2014.

¹⁶⁵ Shepherd 2007.

¹⁶⁶ Winter 1993, 288.

¹⁶⁷ Shepherd 2007, 55.

¹⁶⁸ E.g. Kovachev *et al.* 2011.

¹⁶⁹ Billot 2010, 303-304.

¹⁷⁰ Åkerström 1966; Winter 1993.

¹⁷¹ Glendinning 2005, 82.

¹⁷² Winter 1993, 251-254.

¹⁷³ Åkerström 1966, 195; Wikander 1988.

¹⁷⁴ See Hendrickson and Blackman 1999 for a typical Hellenistic example.

the few published examples available. I have used a convenient shorthand for this general category without especially suggesting a defined type, by terming this general type “Hellenistic Anatolian”, to suggest its development from the earlier forms (Article IV). We do not find Laconian tiles in the early periods in Asia Minor,¹⁷⁵ and Laconian-style tiles only enter the repertoire of tiles in Asia Minor in later periods. There is an example from the Hellenistic period from Ilion/Troia.¹⁷⁶

When looking further east in the Mediterranean, towards the Levantine region, despite the lack of both material and research, it can be generally seen that roof tiling was connected to the urbanization process brought about by the establishment of the Hellenistic kingdoms and the consequent adoption of Hellenistic architecture in these areas (Article IV).¹⁷⁷ Some limited evidence seems to hint that terracotta roof tiles might also have been employed prior to that, when the wave of Greek colonization reached the area in the 6th -5th c. BCE, as tiles would have been used on the roofs of the Greek temples.¹⁷⁸ The increased use of tile can also possibly be related to the specific need for fireproof building materials in urban contexts.¹⁷⁹ This urbanization process started in the late 4th century BCE in what became the Seleucid Empire, extending down the Levantine coast. Hellenistic Antioch made extensive use of tiles on its roofs, as can be seen from sources and the available (scant) archaeological finds in the region;¹⁸⁰ Alexandria was also extensively roofed with tiles (Article IV).

The research literature includes little evidence on how the Hellenistic tile types looked in the N Levantine region. This is particularly obvious for the larger urban centres. The few references available point to the adaptation of the systems in the hybrid format, with flat pan tiles and semi-circular cover tiles, which I have termed Hellenistic Anatolian. Beirut/Berytos, where our knowledge is more extensive due to the research carried out by Phil Mills (2013), seems to have had an extensive element of tiled roofs during the Seleucid period; even modest buildings seem to have been roofed with (imported) tiles.¹⁸¹ Here, the Corinthian type was used in the Hellenistic period, with a faceted cover tile, contrary to what seems to have happened elsewhere, and thus making Beirut a unique area. However, the earliest type used in Beirut during the Persian period seems to have been hybrid.¹⁸² On the other hand, Laconian-style tiles have been found from the Hellenistic levels of

¹⁷⁵ Åkerström 1966, 203.

¹⁷⁶ Hasaki 1999, 228.

¹⁷⁷ Mills 2013; Newson *et al.* 2010, 25-26.

¹⁷⁸ Beirut: Mills 2013; but for the negative evidence for Dor see Martin 2014.

¹⁷⁹ Mills 2015b; Wikander 1988.

¹⁸⁰ Brands 2010.

¹⁸¹ Mills 2013, 98.

¹⁸² Mills 2013.

Dura Europos,¹⁸³ indicating that the Hellenistic city foundations adopted even minor architectural styles from their homelands. Another Hellenistic site with ceramic roof tiles was Jebel Khalid on the Euphrates, where tiles were found in the Governor's Palace.¹⁸⁴

Throughout this area, we again lack research on the extent of tile use in the Classical and Hellenistic periods, but most likely it again concentrates on urban public buildings; in the area of the Hellenistic kingdoms, we should generally expect tile use in urban public and private elite construction, but probably also in rural elite buildings.¹⁸⁵ It has been suggested that using tiled roofs vs. flat reed-and-plaster roofs following the Mesopotamian tradition was linked either to "Greek" influence/identity or to more local traditions, with locally varying responses.¹⁸⁶ This general image is however in need of much refinement and detail. One particularly interesting question, and one that cannot be answered with the research at hand, is how deeply the habit of roof tile use penetrated into the hierarchy of the built environment during the Hellenistic period in this region.

Outside the direct influence of Hellenistic urbanization, little evidence is to be found for the use of ceramic roof tiles. Earlier research has sometimes suggested that tiled roofs were first introduced to the region as a consequence of the Roman conquest.¹⁸⁷ Based on the research presented in Article IV, at least in the Petra region, their introduction is related to the urban development of the last centuries BCE. This means that ceramic roof tiles were adopted for use in Petra already before the Roman conquest, following the Hellenistic traditions already familiar from the N Levant, with a simplified Corinthian-style flat pan, usually with ridge, and with semi-circular cover tiles (Ez Zantur Type 1, Article IV, 91).

This summary review emphasises some general trends in the pre-Roman-period development of the types of roof tiles used. All tiles in the eastern Mediterranean shared the same origin, being based on the Archaic Greek systems, but were adopted outside the Greek core regions mostly in the hybrid version, with quite a wide variety of regional adaptations and diverse style choices, and simplified over time. This adoption started from western Anatolia already in the 7th century BCE, and was extended during the Hellenistic period to the Hellenised areas of the successor kingdoms. Tile use contexts were limited to urban public and finer domestic architecture, although evidence is still too limited to draw overreaching conclusions. What is interesting in especially the Greek areas, but also in Asia Minor and the Levant, is that there

¹⁸³ Rostovtzeff 1944.

¹⁸⁴ Clarke 2002, 31-32.

¹⁸⁵ Mills 2015a.

¹⁸⁶ Baird 2006, 116, 213; examples of such a regional adaptation are Jebel Khalid, where the Hellenistic houses were tiled versus Dura Europos, where they were not (the Dura tiles are related to only one (commercial?) building flanking the Agora).

¹⁸⁷ E.g. Palestine: Landgraf 1980, 83; Petra: Zayadine and Fajarat 1991 cited in Article IV, 95.

was such a clear adherence to long-term systemic thinking in the components, translating into regional styles. This can be contrasted with and analysed against what the research material itself indicates happened during the Roman period; this is addressed in Chapter 3.2.

3.1.2 PRESENCE IN THE ARCHAEOLOGICAL LANDSCAPE

This second chapter discusses our current knowledge about the presence of Roman-period tiles in the archaeological landscape of the eastern Mediterranean, for which this study has produced a more nuanced understanding, as set out in Chapter 1.2. The questions started with the “Ward-Perkins paradigm”, related to the omnipresence of tiles in the archaeological landscape in Rome and Italian mainland, the result of their use in virtually all buildings.

Based on the material studied and the related literature, it is clear that differing conditions prevailed in the extent to which tiles were used for roofing, and hence in their presence in the archaeological record in the eastern provinces of the Roman Empire - which, after all, covers a vast area. In Greece, tiles had become increasingly common during the Hellenistic period (see above), and by the Roman period they are present in many archaeological contexts. These include at least urban construction in most of its formats, and the more affluent rural settlements, buildings, and *villae rusticae* of the countryside.¹⁸⁸ One clear example is presented by the Paliambela site itself, where tiles are also abundant outside the church and atrium area, suggesting that other buildings in the settlement also had tiled roofs.¹⁸⁹

There is still little exact evidence for how other categories of rural or village sites in Greece stand in this regard; what is clear is that tiles are one of the most common components of the “ceramic carpet” of the Roman period, which dominates rural object scatters in surveys.¹⁹⁰ This wealth of tiles must have come from somewhere, and in general should indicate that many kinds of buildings in the countryside were also tiled. It is however not well verified whether we can use tiles as an automatic indicator of the presence of farmsteads, as has been the case in many surveys in Greece; what we lack are qualitative excavations that would look into different kinds of tile scatters in the surveyed areas. This is one clear area for future development in survey and research methodology.¹⁹¹ Other types of roofing were known and available in Greece, including flat reed roofs and wooden or stone shingles, and we have

¹⁸⁸ E.g. Adam-Veleni 2012, near Paliambela; see also contributions in Rizakis and Touratsoglou 2013.

¹⁸⁹ Pettersson and Karivieri 2017.

¹⁹⁰ See, e.g. Salem 2017; also Wells and Runnels 1996; Shipley 1996, 274; Forsén & Forsén 2003; Hjolman 2005; Bintliff 2007; Forsén and Tikkala 2011.

¹⁹¹ See also Salem 2017.

evidence for the use of these during the Roman period as well.¹⁹² It is useful to remember in this connection that environmental conditions could affect the choice of roofing materials. This has been postulated for late Republican Italy, with its heavier rainfall and occasional winter snow loads, which tiled roofs can easily repel.¹⁹³ Similar conditions also applied in some areas in Greece, and might have impacted favourably on the popularity of tiled roofs.

On the other hand, in itself, the Paliambela church represents one of the commonest tiled contexts of the Late Roman – Early Byzantine period: that of a basilica church. As there was a veritable boom of Early Christian church building all over the Roman world during this period, the occurrence of tiles - as a component of this very standardised architectural format - multiplies in many areas of the Empire.¹⁹⁴ This is evident in Greece, but also very visible in the Near East. In particular, these church contexts might represent the commonest and almost only tiled contexts in the later Roman periods in the Near East. They are certainly very prominent in Petra, where both the churches of the city centre (Article IV) and the church of the Monastery of Aaron were roofed with tiles (Article III), in contrast to some other monumental buildings, and in particular domestic architecture.

This study was not able to take a close enough look into the presence of tiles in Roman Asia Minor to provide a summary of the presence of tiles in the archaeological record there. It is generally stated that, contrary to previous periods, ceramic roof tiles were widely used in many buildings during the Late Roman to Early Byzantine periods in Asia Minor, and are thus more visible in the archaeological record.¹⁹⁵ Similarly, some preliminary results can be outlined for the Roman Near East. As discussed in the previous chapter, the use of tile enters the area with the introduction of Hellenistic urbanization, which happens at different times in different areas. In the N Levant this happens already quite early in the Hellenistic period in urban contexts, and possibly in some elite rural contexts. There is a general understanding that the amount of tile (and brick) increases during the Roman period;¹⁹⁶ whether this is related to the increased building programmes of the Roman period or to some other factors is not currently fully understood. However, it seems there is also a gradual increase in tile from rural contexts in the N Levant during the Roman period. Tiles are components of rural settlements surveyed in the Homs hinterland, but tiled roofs correspond at most to single structures with tiles. In the Early Byzantine period these would probably have been churches; for earlier periods, Mills suggests large farming installations in the rural areas.¹⁹⁷ Rural tile presence is also attested near Antioch, but the

¹⁹² Costello 2014.

¹⁹³ Shepherd 2007.

¹⁹⁴ See also comments by Vitti M 2015, 187.

¹⁹⁵ Cassis *et al.* 2018, 387.

¹⁹⁶ Mills 2013, 98-99; Newson 2016.

¹⁹⁷ Newson *et al.* 2010; Mills 2015b, 93.

circumstances do not indicate which kinds of installations they belong to.¹⁹⁸ Casana makes a note that a light tile presence from the Roman period might also be lost in the overwhelming abundance of Bronze Age remains in N Levant.¹⁹⁹ In the Amuq valley, roof tiles are commonly found in settlement sites, particularly from the late Roman period onwards, combined with the mudbrick architecture of the walls. Newson notes that, in addition to being related to the cultural changes of the period, this increased use of ceramic roof tiles may also reflect a more practical influence, such as an increase in rainfall during the Late Roman/Byzantine periods, as also postulated in other regions for this period.²⁰⁰

The situation seems to be slightly different in the S Levant region. The clearest evidence produced by this study comes naturally from the Petra region, and stands as a kind of case study.

The earliest evidence for roof tile use in this region is clearly related to the general trend of urbanization in Nabataean Petra in the 1st century BCE (Article IV, 100-101). One noteworthy result from the research on the Ez Zantur assemblage was the pinpointing of the introduction of tile use in the Petra region to the 1st c. CE, possibly even to the 1st c. BCE (Article IV, 102-103). To chart the frequency of tile use in this area, all issues of the yearly archaeological reports published in the *Annual of the Department of Antiquities in Jordan (ADAJ)* from the 1980's onwards were searched for mentions of roof tiles, as well as the larger survey publications from near Petra.²⁰¹ In all of this material, only a single mention exists of tiles found in rural contexts; this comes from the area between Jerash and Tell el-Husun, from an installation that the surveyor assumed was a possible Roman farmstead.²⁰² In addition, virtually all domestic contexts in Petra seem to have been flat-roofed, with no tiles present, as has been shown in Article IV (Article IV, 93-94). Tile use was limited to the imposing public constructions that followed Hellenistic architectural models. Within this category belong the temples, the royal palaces, and the colonnaded street in Petra, as outlined in Article IV (Article IV, 99), and a similar contextualisation of roof tiles also seems to be normative in the other large urban centres in this region during the Roman period. It is also evident that like in N Levant, there was a clear connection between church building and the increased use of tiled roofs in later, Early Byzantine period, exemplified here by the Byzantine churches of Petra with tiled roofs (Article III).²⁰³

In summary, while very frequent in the Greek archaeological record during the Roman period, ceramic tile has a very low to minimal penetration

¹⁹⁸ Mills 2015b, 93.

¹⁹⁹ Casana 2014.

²⁰⁰ Newson 2016, 200.

²⁰¹ Kouki and Lavento 2013; Knodell *et al.* 2016.

²⁰² Site 8; Leonard 1987, 348.

²⁰³ Also noted by Seligman 2015, 168.

into the Roman-period countryside of Arabia. There seems to be a gradual transition in the level and frequency of tile use in this area during the Roman period, where the use of tiles for roofing domestic buildings seems to be a relevant factor. In light of this factor, the area of the N Levant still seems to display similarities to that of Greece and Asia Minor, in contrast to the S Levant, where the use of tiles in domestic contexts during the Roman period seems to be very limited. However, our understanding of this situation still rests on only limited published examples. More research is needed to clarify this initial assessment as produced in this research.

The situation described above is relevant for instances where tiled roofs have been employed, and for roof tiles in primary use. The presence of tiles in the archaeological landscape can, however, be affected by other processes than the direct use of tiles for roofing, a factor which is also relevant within the context of this study. One factor affecting this material is the use of tile in other contexts than roofing, and the other is recycling. Both of these have bearing on what the presence of tiles in an archaeological context means, and how they can be interpreted - and both are evident in the materials included here.

Recycling presents a major issue that needs to be taken into account when considering the presence of ceramic building materials in the archaeological record. In general, recycling of both whole and broken roof tiles is well attested in antiquity, for both reuse and for secondary use.²⁰⁴ At a more detailed level, this is attested in literary sources, such as inscriptions, in the Classical and Hellenistic periods, where sources suggest that it was even desirable to seek “mature” tiles for reuse as these were of demonstrated good quality.²⁰⁵ There clearly was a healthy market for recycled tiles; a beautifully preserved graffiti from Pompeii advertised recycled roof tiles for sale.²⁰⁶ In the area under study, examples of reclaimed tiles collected and stockpiled for reuse can be found e.g. in Edessa (Article I, 49), the Agora of Athens, and the Church of Bishop Isaiah in Gerasa.²⁰⁷ Mills’ research on Roman Beirut showed that used tiles were “curated” for reuse by removing excess mortar from them. This supports the existence of a sophisticated second-hand building material “industry”.²⁰⁸ This makes the dating of this material a very delicate exercise, and in addition the tiles may also have been moved from their original use site.

There are indications in the research literature both for and against the reuse of tiles on roofs. We know of examples where older tiles have been found in much later roofs; one famous example relates to the roof tiles from Santa Maria Maggiore in Rome, published by Eva Margareta Steinby.²⁰⁹ This

²⁰⁴ Kurzmann 2006, 209-214; Barker 2010; Mills 2013; Gerolimou 2014, 70-71. See also Taxel 2018, 107 for reuse.

²⁰⁵ Manacorda 2000, 138.

²⁰⁶ Dessales 2011, 59.

²⁰⁷ Athens: 7th century AD, Shear 1972, 397; Gerasa: Clark 1986, 317.

²⁰⁸ Mills 2013, 94.

²⁰⁹ Steinby 1973-74.

material was removed from the roof of the church in 1970's, but contained tiles from different periods, starting from complete tiles of the 1st century CE. These tiles had therefore remained intact (or at least usable) for 2000 years. We also know that Pansiana-stamped tiles from an Adriatic workshop that was operational in the early Imperial period were used in the 13th-century AD repairs of the Palace of Split.²¹⁰ On the other hand, Benjamin Clément's research indicated that the reuse of recycled roof tiles on roofs was not very common compared to their reuse in other contexts. This is related to the fact that pan roof tiles break more easily than bricks; and that the proper setting of a roof required the tiles to be of equal sizes in order to work properly.²¹¹

The reuse of roof tiles in other contexts than roofing is also evidenced in the research literature. This primarily took the form of using complete tiles in drainage or for covering graves; or using tile fragments in paving or as a replacement for brick or stone in wall construction.²¹² Examining all of these contexts would require more space than is available here. Within the confines of this paper, it is only pointed out that first of all, it is not clear in all cases, especially in the case of tile-covered graves, whether this constitutes a primary or secondary use for ceramic roof tiles. As noted in Article I, there are reasons to question whether tiles were specifically manufactured for graves.²¹³ This would be interesting to look into in more detail, which has not been possible in the current study. Overall, tile-covered graves presumably only exist in areas where roof tiles in general were common as construction material. Secondly, it is noted that reused tile material creates biases in the archaeological record, for example suggesting tiled roofs in contexts where there have been none, which is why the possibility of reuse should always be taken into account when approaching an assemblage.

In the material studied, there are phenomena that are related to both recycling for primary use, and for reuse in secondary contexts. Although I propose, based on the nature of the assemblage in Paliambela (Articles I and II), that the tiles from the Paliambela church were the original ones placed on the roof at the time of the construction of the church in the latter half of the 5th century CE, it is equally evident that this roof did not stay wholly intact until it collapsed at the end of the lifetime of the church, sometime in the 7th century CE. The assemblage contained tiles that were clearly of another type than the original tiles, and my research assumed that these were later replacement tiles (Article I, 57-59). Lacking absolute datings for the material, it is not possible to say whether these tiles are in fact later than the original tiles. Neither do we have precise dating available for the majority type of tiles, which leaves the possibility at least open (although considered less likely) that some of the original tiles would have been reused. The results of the provenance analysis,

²¹⁰ Lancaster 2015a, 244, n. 13.

²¹¹ Clément 2013, 118-119.

²¹² E.g. Mills 2013, 96; Taxel 2018, 113.

²¹³ Also questioned by Mills 2013, 96.

discussed in Chapter 3.3.1., indicate that the tiles had mostly one provenance, and therefore were not likely salvaged tiles from various origins. Therefore, in this case reuse on roofs would not be a factor in the formation of this tile assemblage.

For the reuse of tile fragments in secondary contexts, the material under study provided a good case study. Both sites studied in Petra, that of the Ez Zantur House IV and the Monastery of Aaron, turned out to be assemblages which came from secondary use contexts, where tile fragments had been used as additional material in stone and rubble walls. In the case of the Monastery of Aaron, these tile fragments most probably derived from the remains of the original tiled roof or roofs of the church and the chapel (Article III, 385), although it cannot be fully ruled out that recycled tile material for construction would have been brought from elsewhere as well. The ceramic building material assemblage contains e.g. some hypocaust bricks, but no such constructions exist on the summit of the mountain. This part of the material may have been brought up from Petra city area (Article III, 384).

The Ez Zantur house IV offers another very interesting outlook on recycling. These tile fragments were most likely also recycled pieces used in the wall construction, based on the evident signs of reworking in the fragments as well as their contexts and frequency. However, this tile material had in all likelihood never been used in this house, which was not tile-roofed at any point in its history. More likely, it derived from the city itself, and in this way represents a set of salvaged materials with different origins (Article IV, 94). The case of Ez Zantur shows a probably very common way of reusing tile fragments in the Roman world, and underlines the fact that we cannot automatically equate the presence of tiles in the archaeological record with tiled roofs having existed at the same site.

A final note on the discussion of the relative frequency of roof tiles relates to the original paradigm of the fully-tiled Italian countryside. Tiles were obviously very much present in all kinds of contexts, and are an abundant category of finds in Italy. Still, concrete evidence on in exactly which kinds of contexts tiles were used in the rural areas is still rather thin, and the situation may not be as self-evident as we assume. A field survey around Nepi, concentrating on the presence of all pottery including tiles, found surprisingly little evidence of rural tile use outside large villas, in contrast with the standard view, suggesting that further verification of the contexts of use would be required even in Italy.²¹⁴

²¹⁴ Mills 2015b, 94.

3.2 REGIONAL TYPES AND VARIATION IN ROMAN ROOF TILES IN THE EAST

The second question posed in this research concerned the types of tiles used in the eastern part of the Mediterranean during the Roman period. This question relates both to which kinds of types were in use, and whether a more nuanced typology of roof tiles was possible. There was clearly a difference between the roof tile types of the western and eastern provinces, and the differing development trajectories of the pre-Roman materials have been outlined in previous chapters. In the West, this trajectory led to the formalization of the *tegula*, which by the early Imperial period had developed into a standardized form: a flat pan, with rounded square narrowing flanges with upper and lower corner cutaways, always combined with a semi-circular cover tile. Despite the stylistic variation apparent in this region, this type remains quite standard throughout the western provinces (Fig. 10).

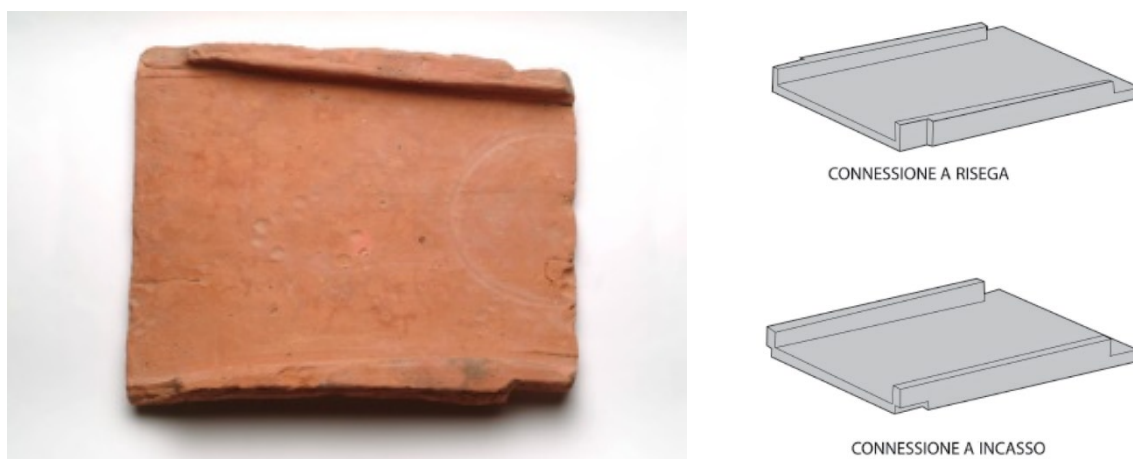


Fig. 10a and b. Left (a): A standard *tegula* from Roman London. Photo: Museum of London, CC-BY0. Right (b): the two types of plain roof tiles from Italy with differing cutaways, Shepherd 2015, Fig. 1 (used with permission).

Our understanding of the tile types in the eastern part of the Mediterranean during the Roman period rests on the established recognition of the Archaic tile systems. This study recognized that though not erroneous in its essentials, the dominance of this view has created a situation where fragments are categorized in the general groups of Laconian (curving) and Corinthian (flat) pan tiles, and assigned only broad dating brackets (Hellenistic, Roman, Late Roman).²¹⁵ Such a situation cannot be considered sufficiently nuanced in light of the results of this research.

²¹⁵ Hellman 2001, 298-299; Koskinas 2011.

The tile assemblages included in this study allowed for an analysis to be made of what elements might be used to construct a typology of plain tiles in the East. Based on this overview of regional typological elements, they further allow a preliminary assessment of eastern tile typologies, and type areas in general, for the Roman period. The material included in this research is not extensive enough by far to function as a solid basis for a typology or typologies of plain tiles of the Roman Empire, but its cross-regional nature does open up possibilities in pointing our way towards the regional typologies of plain tiles in the East. It also points towards the elements that would be necessary to record in future field documentation as a means towards better tile typologies.

3.2.1 DEFINING ROMAN-PERIOD TILE TYPES IN GREECE AND JORDAN

The definition of Roman-period tile types in this research is based on the assemblages described in the articles included. These represent case studies from the areas of Roman Greece and Nabataean-Roman Arabia, demonstrating the kind of regional variation that existed in tile types. In general, we have a much better understanding of the development of tile forms in the Greek mainland than in the Near East; however, a general definition of types will be attempted for both areas even when it remains in places descriptive rather than comparative. The analysis first describes the general picture in the research areas, and then seeks out those stylistic and technical elements in the tiles that develop in a consistent manner over time.

The Laconian-style tiles from Paliambela act as a representative example of the type in this research (Fig. 11). These tiles are simple rectangular curving pan-tiles, smoothed and usually slipped on the upper side. The curve of the pan varies in articulation, as does the form of the long edges (flanges). Their elements are analysed below in detail, and full descriptions of the fragments included can be found in Article I.

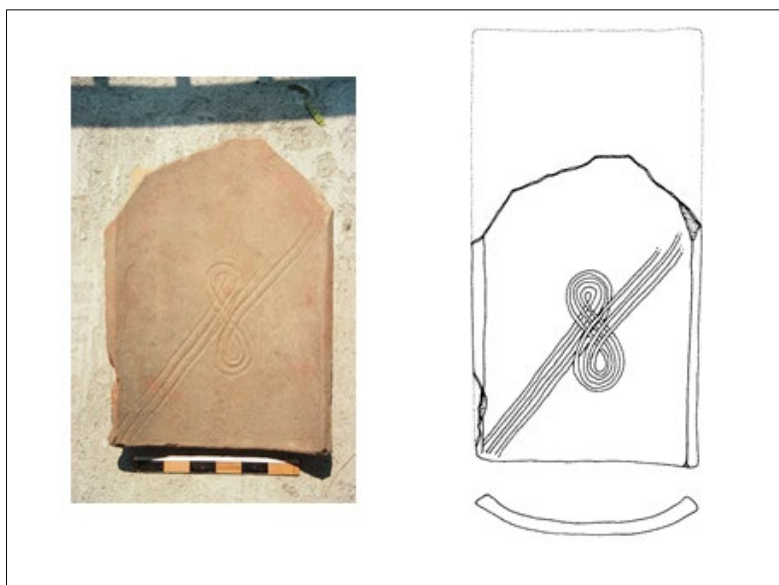


Fig. 11. Late Roman Laconian-style tiles from Paliambela, N Greece, Cat. no. 16, Article I, Fig. 2 and Plate IV.

Based on the published examples, there was a clear continuity in the types of roof tiles used from the Hellenistic to the Roman periods.²¹⁶ The Laconian-style tile had by the Roman period become the dominant tile type used in construction, both public and private.²¹⁷ The Corinthian-style tile continued in use (Fig. 12). It, too, had been transformed into a simpler form, retaining however the flat pans and the adherence to gabled cover tiles. Good examples for Late Roman Corinthian-style tiles are rare, and this type is not fully analysed in this study. The general assessment is that the Corinthian-style system was employed especially in contexts that were prestigious, but by the Late Roman period it had become rare even in these contexts. Their use in this period is attested, for example, in Corinth and in Roman Knossos on Crete, but there are also examples of sites with simultaneous use of Laconian-style and Corinthian-style roofs, from separate but possibly also from same buildings, again in Corinth but also from Kourion on Cyprus.²¹⁸ Churches, such as Paliambela, seem to have been in general roofed with Laconian-style tiles.²¹⁹

²¹⁶ Noted also by Sackett 1992.

²¹⁷ Koskinas 2011

²¹⁸ Knossos, in several types: Sackett 1992; Corinth: Bookidis and Stroud 1997; Kourion: Megaw 2008. Possibly on same buildings in Corinth, see De Domenico 2018, 309.

²¹⁹ See references in Article I; see also Pallas 1980, fig. 110, Laconian-style pan tiles from the Kraneion basilica in Corinth; and a tile from the tile graves in the Panayia field (Corinth Image: bw 1998 020 31).

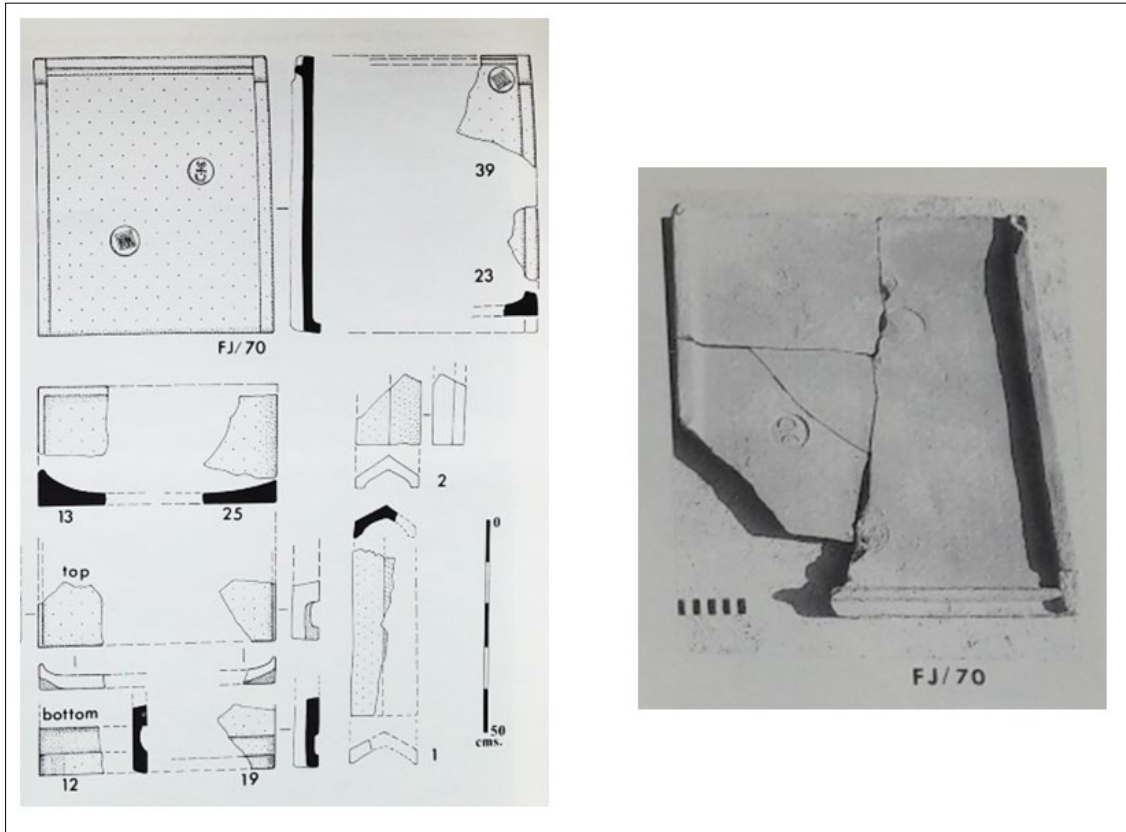


Fig. 12. Roman-period Corinthian-style tiles from Knossos. From Sackett 1992, Plate 23 and Plate 222.

The second set of representative examples derives from the Ez Zantur House IV in Petra; in addition, a well-documented tile from the Petra Great Temple excavations is presented.²²⁰ The material from Ez Zantur contains two different types of roof tiles, which have been termed Ez Zantur Type 1 and Type 2 (Article IV). Type 1 is a simple, flat-panned tile with square flanges and a ridge at one short end; Type 2 is a more elaborate flat-panned tile with sharp angular flanges and a ridge, upper cutaways, and a “rippled” surface (Fig. 13).

²²⁰ Joukowsky 2007

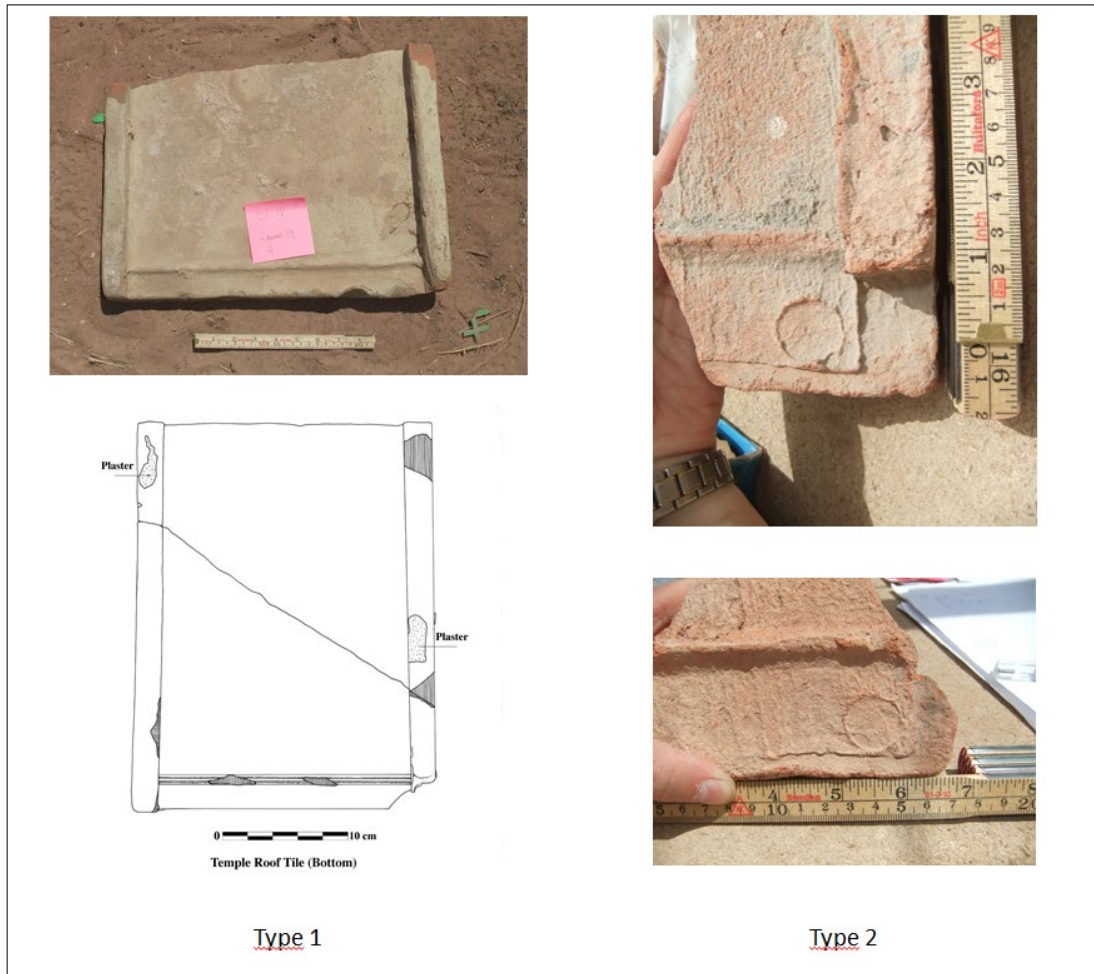


Fig. 13. The two roof tile types (Ez Zantur 1 and 2) from Petra. Drawing from Joukowsky 2007, CC-BY 4.0.

Type 1 clearly reflects the genealogy of the tiles in this area, by following the type termed Hellenistic Anatolian in this study. The second type belongs generally to this tradition as well, with its flanges and ridge, but is clearly an individual, elaborated type. This picture of the use of traditional forms combined with regional diversity holds generally for the whole region of the Roman Near East. Further examples of tiles from elsewhere in this area are referenced in the text below, but it should be specifically mentioned that Type 2 tiles have also been found in Humayma, S of Petra (Article IV, 104).

To this can be added the later, Roman and Byzantine-period tiles from the Monastery of Aaron, which display a number of different profiles and types (Article III). Although these cannot currently be placed in a broader typology, they underline the dominance of the hybrid tradition and its wide regional variation in the area.

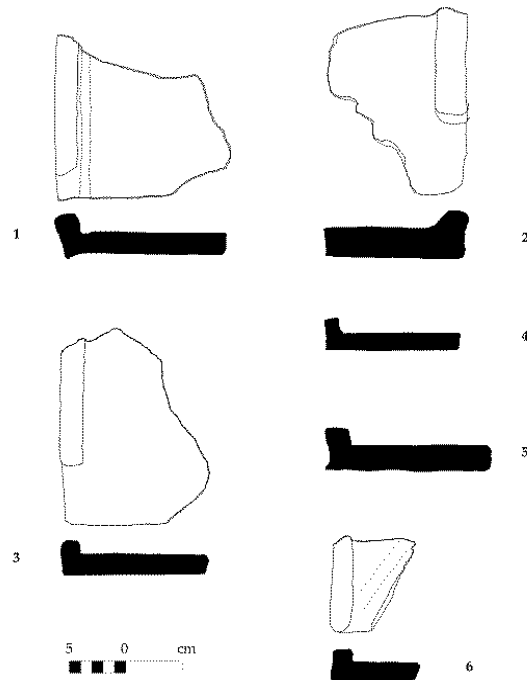


Fig. 14. Some examples of roof tile types from the Monastery of Aaron site; in the original Article III, these were placed in the category of Type A, based on the form of the flange, which however currently seems to require some revision or rethinking.

In general, based on the above and related finds, typologically we can detect a general simplification of forms and features compared to those of the original counterparts from the Archaic and Classical periods. In order to work towards a possible typology, these simplified features need to be looked at in more detail, and the elements indicative of consistent change deconstructed. In the remainder of this chapter, I will discuss the tiles from a morphological point of view, analysing elements that might prove to be viable characteristics of a tile typology, and tie these to the assemblages included in the study.

For the plain roof tiles of the Roman period, we can make a preliminary listing of the elements that could function as a basis for typologies. These are mostly based on western tiles and the Laconian-style tiles of Greece, but are also applicable to other plain tile types. Although too cautious to suggest that better typologies could be developed for plain Laconian tiles, Skoog considers the following elements as those worth looking at in Laconian-style tiles: dimensions, profiles, and decoration.²²¹ Koskinas adds to this list: surface treatment, edges (flanges), and fabrics.²²² Although she does not believe it is possible to distinguish change in plain Laconian tiles, Winter also lists shape and proportions as changing elements.²²³ Wikander also provides a list of

²²¹ Skoog 1998, 15-16, 121-122.

²²² Koskinas 2011, 549-550.

²²³ Winter 1993, 108.

distinguishing elements for the basic components (pan tiles, cover tiles, and ridge tiles) of the Archaic period.²²⁴ Based on the previous research outlined above and the results from the current study, the following elements were determined to be relevant from a morphological point of view: *form*, *profile*, *flange shapes*, *size*, *cutaways*, *surface features*, and *fabrics*. These are discussed in detail below for the study assemblages, and the conclusions to be drawn from them are identified.

Form

The first element is called form, which in this context means the shape of the pan tile as seen from above, its two-dimensional shape. The variation within this element is related mainly to whether the tiles are rectangular or tapering.

The tiles in the Paliambela material are rectangular, with upper and lower ends of equal width, and with only slight indications of tapering (Article I, 45). There is a clear change in this feature from earlier tiles. The Archaic Laconian pan tiles had a tapering shape, where the narrower lower end of the tile was fitted on top of the wider end of the tile below.²²⁵ This feature seems to be present also in the Hellenistic Laconian-style tiles.²²⁶ However, contrary to the findings from Paliambela, the Late Roman period Laconian-style pan tiles from the Sikyon survey are estimated to have been tapering, with backup references from other published sites.²²⁷ It is also noted that the tile standard from the Athenian Agora (see below) indicates a distinctly tapering form for the Laconian tiles. The rectangular shape of the Paliambela tiles is definite, and it remains the task of future research to determine the nature of these differences on temporal and regional scales. As a typological feature, it certainly has potential.

Although the tile assemblages from Petra do not contain much evidence from complete tiles, some general tendencies in terms of forms can be detected. One such is that the tiles in both assemblages, the earlier and the later tiles, seem to be strictly rectangular (Article III, 380; Article IV, 91). This is in line with their genealogy, which is based on the Hellenistic Anatolian type. Their prototype, the original Corinthian-style tiles of the Archaic and Classical period, seems to be rectangular,²²⁸ and the few examples from the Hellenistic period follow this tradition.²²⁹ However, this element varies regionally, as tapering was recorded for the Byzantine pan tiles Gadara in Jordan.²³⁰

²²⁴ Wikander 1988, 208-213.

²²⁵ Skoog 1998, 3; Koskinas 2011, 552.

²²⁶ Backe-Forsberg 1978.

²²⁷ Koskinas 2011, 559.

²²⁸ Winter 1993, 82.

²²⁹ Sarantidis 2015.

²³⁰ Vriezen 1995.

Profile

The second element considered is the profile of the tiles, which means the cross-cut across the width of the tile. In this element, only the general profile of the pan, and not the shape of the flange, is considered (see below for flange).

The most characteristic feature of the Laconian-style pan tiles is the gently curving profile of the pan (see Fig. 11). In the Paliambela tiles, the height of the flange was, at the maximum, elevated 0,09m from the lowest point (bottom). Although generally similar in dimensions, the curve can vary from continuous (meaning that there are no pronounced turning points in the profile) to a more angular profile (Article I). This observation of variation in the profile curve within one material type is reinforced by research done on Kefallonia,²³¹ and on Thassos.²³² From the few examples and images available for the Archaic Laconian tiles, the curvature and the height of flange displays the same general tendency, although based on the representations it seems that the profile of the Archaic tiles was shallower than in the Roman tiles.²³³ All of the above means that the way the curve was executed in the tiles during the manufacturing process did not change much during the lifetime of the type. Moreover, it was a technique that did not allow for very exact shapes in the profiles. This is not so much based on the comparison with early and late Laconian-style tiles, as on the evident variation in the Paliambela material. It is contradictory that the most recognizable feature of the Laconian-style tiles cannot readily be used as a typological feature. However, this conclusion should be verified by a much larger sample than has been used here.

In contrast, the Roman-period tiles from Petra conform to the flat-panned variety, which means that their profile is straight, with the flanges rising more or less horizontally from the edges. The only possible typologically meaningful variation might be related to the width-thickness ratio of the profile (and also the flange), where there is discernible variation e.g. in the Mountain of Aaron assemblage (Article III), as well as in the only partially published Ez Zantur material (Article IV). However, since both assemblages of flat-panned tiles from Petra consist of an accumulation of tiles of different origins, it cannot be verified that this variation would be a meaningful temporal and typological factor. This element in the flat-panned tiles might have potential, but would require well-defined and single-use assemblages for verification.

²³¹ Randsborg 2002, 149, Fig. VI.1.

²³² Sodini and Kolokotsas 1984, 184, fig. 148.

²³³ See for example profiles in Winter 1993, fig. 11 and fig. 14.

Flange

The flange, as listed in Chapter 1.2, means the long edges of the tile that are usually defined by an upward bend and profiling of different kinds. Out of all the elements in the tiles, flanges have most commonly been used for categorizations in earlier studies.

The Paliambela material presents a variety of flange shapes. These are articulated differently from the Roman *tegula*, which basically has an upturned, square, or rounded flange along the long sides of the flat pan (see Fig. 10). Flanges in Laconian-style tiles are terminals of the profile curve and thickenings of the long edges, which can be almost non-existent, or have a very distinct profile, like a wing (Article I). Using flange shapes as features in typologies is problematic. One indication of this, at least in the Paliambela material, is demonstrated by the three tiles with the same signature figure (Article II, 45), which show a variety of flange shapes, even within one tile. This suggests that tiles with a shared provenance (see below) could have a reasonably large variation in flange shapes. Some of the examples available from Archaic Laconian tiles also show a variety of slanted, faceted, rounded, or flat edges; the studies by Koskinas support the notion that flange shapes do not seem to differentiate greatly between periods.²³⁴ This is contrary to the results obtained by Randsborg in Kefallonia, who links the changing shape of the flange to datable groups in Laconian-style tiles.²³⁵ Regardless, the Laconian-style tiles from Kefallonia display similar kinds of flange profiles as the ones from Paliambela, especially in Randsborgs' groups 2 and 3, which are dated to the Roman period.

The flanges in the assemblages from Petra generally resemble those of Roman *tegulae*: basically square-shaped flanges that are raised in a 90-degree turn from the pan. Article III even attempts to make a categorization based on the flange shapes, which were indeed extremely varied in the material. Currently, there is nothing specific that would show that this categorization is not indicative of a temporal differentiation; however, as the research has progressed, it seems more and more probable that flange shapes would not be indicative of a datable typology, an issue that is discussed below. In any case, the flanges represented in the Jabal Haroun material vary accordingly, from low, square flanges to high, elaborate narrow flanges (see figs. 1-16 in Article III), sometimes vertical, sometimes leaning in or out. Even taking into account the heterogeneous nature of the assemblage, this represents a high degree of variation within one assemblage.

In the Ez Zantur material, which outside of the few tiles described in Article IV still awaits publication, a similar amount of flange variation is present. Generally, the flanges follow the two types of tiles presented in Article IV: the earlier type with rounded and solid square flanges, and the later type

²³⁴ Koskinas 2011, 552.

²³⁵ Randsborg 2002, fig. VI, 1.

with very sharply squared, narrow and almost delicate flanges. In addition to these general categories, the preliminary catalogue consists of subtypes of these main categories, creating a similar multi-shape image of flanges within one material as the other materials from Petra. A similar degree of variation is present in many of the published assemblages in the east: Gadara, Beirut, and even in Miletus, representing Corinthian-style Roman-period tiles in Asia Minor.²³⁶

A particularly interesting example with regard to flanges are the “shovel-like tiles” found e.g. from Jerash.²³⁷ In these tiles, the flanges are not only on the long sides but also extend along one of the short sides, so on three sides of the tile. Although this feature is not present in either the Paliambela or the Petra assemblages, it is however a feature to be found in this area during the period under study, and must be taken into account in this context as it will have implications further on, in the definition of tile type areas.

Researchers in general do not agree on whether the shape of the flange has typological importance in their respective studies.²³⁸ Mills’ work on the tiles from Beirut is the closest available study, and in that material he analysed and confirmed a time-bound typological series for the flange shapes. Due to the nature of his aims and thus documentation practices, it is not possible to combine these types with other typological features except the fabrics.

The examples given above refer to the flat-panned tiles, which were probably made in frame moulds, and therefore better support the production of similar flanges in one production unit. Even though a tentative attempt to apply a flange typology to the Jabal Haroun material was made in this study, its veracity cannot be determined due to the lack of comparative material. For the flat-panned Roman-period tiles in the Near East, then, the determination of whether flange profiles can have the status of a typological element remains inconclusive.

The edge of the Laconian tile, and therefore the flange, was produced by a freer process, at least without constraining moulds. Article I therefore suggests that the formation of the tiles and the flanges was a much less standardized event than for the flat-panned tile types – something in the process caused wide variation in the flange forms. It is therefore probable that definite typologies cannot be built on flange shapes in Laconian-style tiles, although they might allow a sort of long-term development to be followed. Confirming this would require much more comparative material and has implications for documentation standards.

²³⁶ Gadara: Vriezen 1995; Beirut: Mills 2013; Miletus: Berndt 2003, 108.

²³⁷ Ebeling forthcoming. See discussion in the next Chapter on the typology and distribution of these tiles.

²³⁸ Negative: Shepherd 2006, 172; Vriezen 1995; Warry 2006a, 247; Wikander 1993, 27-28; positive: Mills 2013, Clément 2013.

Size

Another extremely tempting element for typology is the size of the tiles, which has been generally demonstrated to be meaningful e.g. in Gaul.²³⁹ The use of this element however suffers from a lack of documented material, and in general from the fact that it is only rarely possible to record both the width and the length of a tile in an assemblage. In Paliambela, this was possible for only seven tiles, and for a further nine tiles the width could be measured (Article I, 41). Additionally, the Ez Zantur assemblage provided information on the possible full sizes of pan tiles at that site (Article IV, 91-92).

The average measurement for Late Roman Laconian-style pan tiles from Paliambela is 0,85 x 0,45 x 0,025 m for a complete tile. For the Archaic Laconian tiles, the estimated sizes given by Winter are larger, up to 1,20 x 0,59 m.²⁴⁰ These early tiles were also thin, having an average thickness of 0,02 m;²⁴¹ the tiles display a trend of becoming thicker in the Late Roman period.²⁴² It is generally accepted that tile sizes in Greece diminished towards the Late Roman period,²⁴³ but as of yet we lack a conclusive series of finds that would confirm this with a large enough sample.

The tile material from the monastery of Aaron was too fragmentary to contain complete tiles, or even contribute to our knowledge of the widths of the tiles, but an estimation of the size of Type 1 tiles could be made for the material from Ez Zantur. This turned out to be ca. c. 0,53 x 0,41 x 0,03 m (Article IV, 92), and based on the *in situ* examples from the heated hypocaust roof was quite consistent across the type. Type II is thinner, 0,02 m. Little evidence is available on tile sizes from other assemblages in the area (Petra Great Temple, Gadara, Beirut). However, it is generally stated that the “Corinthian-style” (flat and ridged) pan-tiles from Beirut, probably used during 4th to 6th centuries CE, were 0,58-0,65 x 0,48-0,51 x 0,02-0,034 m in size, although there was also a smaller model in evidence.²⁴⁴ This indicates a similar size category but a slightly different length-width ratio, emphasizing variability across assemblages. As a comparison, the imperial *tegulae* of Britain vary in size from 0,31 x 0,27 m to 0,57 x 0,48 m,²⁴⁵ or 0,30-0,59 m long;²⁴⁶ Adam provides some further measurements from Italy, generally showing that a *tegula* was slightly, but not much, smaller than its eastern flat counterparts in this period.²⁴⁷

²³⁹ Clément 2013.

²⁴⁰ Winter 1993, 146.

²⁴¹ Koskinas 2011, 552.

²⁴² Koskinas 2011, 559.

²⁴³ Theodoridou 1988.

²⁴⁴ Mills 2015, 31.

²⁴⁵ Brodrigg 1987, 12.

²⁴⁶ Warry 2006, 38.

²⁴⁷ Adam 1994, 213.

When it comes to Laconian-style tiles with their freer form, it is not clear how meaningful size is as a factor in typology. The curved form and the lack of fitting devices in the pan tiles allowed for adjustments to be made while laying the roof, for example in the amount the tiles overlapped, to compensate for any deviating sizes in tiles. In the Paliambela material, the variation in the sizes of the tiles is up to 0,05 m in both dimensions (length/width), for tiles that most probably have common provenance, and certainly were used in the same roof (Article II). Aiming for exact sizes was therefore not such a necessary technical requirement as for Roman *tegulae*.²⁴⁸ Regarding the Petra material, where tiles are of the flat-panned type, you would expect more standard sizes, but this cannot be assessed on the basis of the existing material.

This variation did not however mean that tile sizes could be completely arbitrary. Although the textual sources do not speak of tile regulations except in indirect terms related to production output and house sizes,²⁴⁹ some attempts at exercising control are known, and these manifest themselves primarily in the form of physical standards. Tile standards come in the form of carved stone relief models. The one found from Messenia seems to be Hellenistic in date, and displays the tapering, simple curving shape of a Laconian-style tile, ca. 0,94 x 0,45 m in size.²⁵⁰ The 2nd century CE tile standard cut in marble from the Athenian Agora shows a size of 0,985 x 0,50 x 0,07 m for the Laconian-style pan tiles.²⁵¹ That such standards existed suggests that size standardization was at least an issue to a public body in tile production. However, it is difficult to know to which extent these were followed, and it is easy to see that the sizes given by the standards do not equal those from e.g. Paliambela (Article I, 42).

Regardless of the unclear relation of tile sizes to tile standards, the pattern of development evident in tile sizes indicates that better metrology could well be one factor on which typologies could be based.

Cutaways

Cutaways in the Roman flat-panned *tegulae* are modifications made to the upper and lower corners of the tiles to help the tiles interlock with each other.²⁵² It is exactly these cutaways and their typology which allowed typologies of plain tiles to develop in the western provinces (see Chapter 1.3).

However, this approach seems not to be available in the eastern part of the Roman Empire, at least to the extent it was used in the west. There are no comparable corner cut-outs in the curving Laconian-style pan tiles of any

²⁴⁸ See Clément 2013, 118-119 for discussion on the need for normalized sizes in Roman *tegulae*.

²⁴⁹ Mills 2015b, 90.

²⁵⁰ Themelis 1994.

²⁵¹ Stevens 1950; Orlandos 1966, 83-86 and 92.

²⁵² See Shepherd 2007 for discussion; Warry 2006. See also Fig. 3 for terminology.

period (Article I). However, in the Archaic and Classical Laconian tiles, a raised lip and/or groove at the upper end of the tile can be found.²⁵³ According to Koskinas' results, in pre-Roman Laconian-style tiles the upper short ends are distinguishable, as the edges of the upper side were thickened or flanged, with a vertical groove near the edge on the upper surface.²⁵⁴ Such modifications to the upper (or lower) end of the tile are missing from the Roman Laconian-style tiles; in the whole of the Paliambela material no such modifications were used. The short ends of these tiles are only flat, simple edges without any articulation. Generally, therefore, looking at these end modifications might be a good typological feature to be used in the dating of Laconian-style tiles, if developed further.

The picture looks different when considering the Hellenistic Anatolian-type (flat-panned) tiles from Petra. As recorded in Articles III and IV, there are no lower corner cut-outs in the tile assemblages from Petra. This is a technical omission that is difficult to understand in flat-panned tiles, as it makes fitting the tiles together more difficult, but the evidence, especially from Ez Zantur, is quite clear on this. However, there are upper cutaways, which Peter Warry calls "flanges that are cut back flush with the base",²⁵⁵ meaning that the flanges on each long side do not extend all the way from one short edge to another, but terminate slightly before that. In the Monastery of Aaron assemblage, examples of this are ca. 6 cm, and in Ez Zantur Type 2, ca. 5 cm, easing the overlap of the tiles somewhat (Article IV, 92; Fig. 13). This feature is repeated in the roof tiles from Petra Church, dated to late 5th to early 6th century CE.²⁵⁶

However, the earlier Type 1 tiles from Ez Zantur, and their equivalents from the Great Temple,²⁵⁷ do not have this feature. Instead, their flanges extend all the way from end to end. From the point of view of roof fitting this solution is difficult to understand; however, it is clearly visible in both documented assemblages from Petra for this type of tile. This presents two possibilities in terms of fitting: either the pan tiles were placed overlapping, with the tiles balancing on their flanges, or the tiles were placed level and flush with each other with no overlap. This issue is further discussed in Ch. 3.3.2, on fitting the tiles to the roofs. It should be noted, however, that this feature of no upper flanges is present not only in these tiles, but also on those from e.g. Roman Zeugma and Classical Olynthos in Greece.²⁵⁸ It is not a singular trait of the Petra tiles, and the problem of how these tiles were fitted on the roof concerns a large number of tiles from different periods and areas in the east.

²⁵³ Skoog 1998, 3; Lawson recorded two different types of Laconian-style pan tiles from the Laconia survey, with one of the types one had a groove along one end which was not present in the other type, Lawson 1996, 121.

²⁵⁴ Koskinas 2011, 552-554.

²⁵⁵ Warry 2006b, 3.

²⁵⁶ Personal observation from an example in Petra Museum, 2011.

²⁵⁷ Rababeh 2005, 206; Rababeh 2017, 61, fig. 3.14.

²⁵⁸ Önal 2013; pers. comm E. Cuijpers 12.10.2018.

It is noteworthy that Mills records lower corner cutaways for the hybrid (“Sicilian”) tiles from Beirut.²⁵⁹ The nature of his work, which is focused on fabrics, does not allow for a form-based typological assessment of that assemblage, nor of the cutaway types. This presence of tiles with lower cutaways, which seem to be dated primarily from the Roman period onwards,²⁶⁰ is difficult to explain with the evidence available, and would definitely need more research than has been possible here. It might be explained by the influence of the Roman colonists of that period.²⁶¹ The attribution of this type by Mills to the “Sicilian” type, i.e. the Roman *tegula*, will be discussed in the next chapter.

In conclusion, the intrasite and regional variation which cutaways display in the material record indicates quite clearly that they would be a good element to document and follow in terms of typology, as they have already been shown to be in the western parts of the Empire.

Surface features

The surface features assessed in this section include all of the functional and non-functional surface treatments and marks found on the plain pan tiles that are not the result of the moulding process (such as mould ridges on tile pans, see Articles I and III). These include fingerline signatures, stamps, and added clay elements such as ridges and slip.

Starting with the Laconian-style tiles in Roman Greece, it is immediately obvious that there is a difference between the Archaic and Roman Laconian-style tiles in this regard, which has also been pointed out in previous research.²⁶² The Archaic Laconian pan tiles were usually painted or glazed in a solid colour (black, red, and brown), and this practice of glazing was still present in the Hellenistic period, possibly even in the beginning of the Roman period.²⁶³ In contrast, the Late Roman Laconian-style pan tiles are unpainted and unglazed. They might be slipped, but used the same clay as the tile fabric, thus producing a (reddish-brown) colour similar to the general clay paste. To the category of decoration might be added the usually rougher surface finish of the Roman-period tiles compared to earlier (Hellenistic and older) tiles, due to the finer-grained clay pastes used earlier.²⁶⁴ The assemblages in Petra also showed signs of applying a slip to the surface of the tiles. In particular, the surface of the Type 2 tiles from Ez Zantur is very distinct, with a “rippled” character (Fig. 13), clearly a distinctive element.

²⁵⁹ Mills 2013, 31.

²⁶⁰ Mills 2013, 29.

²⁶¹ Mills 2013, 94.

²⁶² See eg. Skoog 1998, 15-16; Koskinas 2011, 559.

²⁶³ Winter 1993, 95; Lawson 1996, 121; Skoog 1998; Koskinas 2011, 554-555, 558.

²⁶⁴ Koskinas 2011.

However, a feature that the Roman Laconian-style tiles display but the Archaic and Classical tiles do not, are the finger-line signatures on the upper surface of the pan tiles.²⁶⁵ In the Paliambela material, this feature is present in almost all of the tiles, and the shapes used are very varied (Fig. 11; Articles I and II). Signatures are generally cited as typically present in Late Roman – Early Byzantine tiles in Greece.²⁶⁶ Although found also on Hellenistic tiles, the marks used then for the signatures were very simple v-shaped symbols, which clearly develop in complexity towards the later Roman period.²⁶⁷ There is a lot of variety in the patterns used in the Paliambela tiles, strongly suggesting that making a comprehensive analysis of the patterns might yield useful information in terms of temporal and regional/local groups. These signatures are a feature that needs to be tracked in more detail in the Roman-period Laconian-style tiles; a similar survey of the Corinthian-style tiles of the period would also be necessary, but could not be carried out within the confines of this study. Article II strongly emphasizes that they might well function as a defining element in regional studies of tiles.

Neither tile assemblage from Petra shows signatures on the upper surfaces pan tiles, excepting one mark from the Monastery of Aaron material, which is probably more accidental than anything else. However, there are signature-like finger-markings on the lower surfaces of the pan tiles in the Ez Zantur material. In this case, the most plausible explanation is that the markings were put on tiles as a keying aid. This feature of lower-surface fingerlines was not documented in the Monastery of Aaron material (Article III). In other cases, however, the flat-panned, Hellenistic Anatolian-style tiles from the Roman-period Near East could carry signatures, such as those studied in Beirut, although only in limited numbers. Wavy lines between the edge of the tile and the inset flange - that is, on one short end - were recorded on the BER1.2 class of tiles, probably of regional, Levantine manufacture,²⁶⁸ and dated to the Byzantine period.²⁶⁹ In Asia Minor, flat-panned tiles could also carry signatures in styles reminiscent of those in the Laconian-style tiles, such as the pan tiles from Zeugma,²⁷⁰ Amorium,²⁷¹ and Kourion.²⁷²

In contrast to the undecorated pan tiles from Petra, in the documented but largely unpublished assemblage from Ez Zantur a number of the semi-circular

²⁶⁵ Koskinas 2011, 559.

²⁶⁶ Article I, 48, note 47 for references; Gerolimou 2014, 282. Also the Laconian-style tiles from Asia Minor (Amorium) show that fingerline signatures are present in that assemblage, see Witte 2012.

²⁶⁷ Backe-Forsberg 1978, 126; see also Koskinas 2011, 559.

²⁶⁸ Against what has mistakenly been postulated in Article III for the provenance of the group.

²⁶⁹ Mills 2013, 31 and 51; also tiles from BER2.1. class, which is of Cilician provenance, had similar fingerline signatures, Mills 2013, 58-59.

²⁷⁰ Önal 2013.

²⁷¹ Witte 2012.

²⁷² Huffstot 1987.

curving cover tiles have distinct fingerline markings on their upper surfaces. Whether they constitute a signature, in the sense suggested in Article II, is another matter. In this context it is only noted that the figures, wavy and/or straight lines, are clear and deliberate, decoration-like markings and could well be used typologically, in a similar manner as the Paliambela material demonstrated. In addition, it is to be noted that these tiles derive from deposits that are certainly older than 363 CE (the destruction event of the house), and probably derive from 1st century CE materials from the city (Article IV). Contrary to what has been suggested for Beirut, the habit of finger-line-marking cover tiles in this area is not related to a comparative Byzantine-period habit recorded e.g in Sicily and also in Greece (Article I).²⁷³



Fig. 15. Fragment of a semi-circular cover tile with wavy fingerline markings from Ez Zantur IV. Photo: Pirjo Hamari 2011.

In general, the amount of evidence for the habit of scribing signatures in the flat-panned tiles of the Near East is limited. Based on the current information, the habit seems generally to be more infrequent and simpler than in the Greek mainland, when it occurs, but it does show variety that would benefit from better documentation both in terms of types and quantities in tile assemblages.²⁷⁴ Consequently, it might also function as a typological element in this area. Signatures themselves as a phenomenon are discussed in more detail in Chapter 3.3 below.

²⁷³ Mills 2013, 4 for Beirut, speaking of fingerline markings on cover tiles; however, his reference, Wilson, is speaking of combed patterns on Byzantine imbrices in Sicily, Wilson 1979, 23.

²⁷⁴ Some examples of documented signatures on pan tiles from the area include those from Cyprus (Huffstot 1987) as well as those from Jerash (Ebeling *forthc.*) and Tell Keisan (Landgraf 1980, 85).

The few stamps included in the assemblages studied only serve to underline how little of any kind of stamping was used in the Roman-period roof tiles in the eastern Mediterranean, outside of some singular centres and their environs (Nikopolis, Thessaloniki, Corinth, Constantinople, Cyprus, Ephesos, Sagalassos i.a.). A very comprehensive overview has recently been published by Konstantina Gerolimou of the stamped tiles from Nikopolis in Epirus (Roman to Byzantine), with a review of the habit and examples from the area, the results of which will not be repeated here.²⁷⁵ Of the assemblages included, the Laconian-style tiles from Paliambela only contained one stamp, an impressed cross, found on a stray find fragment and therefore not attributable to any context. The fragment also seems to be of different provenance, based on the hand sample analysis, compared to a majority of the tiles in the assemblage, and its origin remains a mystery (Article I, 50). Both the Monastery of Aaron and the Ez Zantur assemblages contained a circular stamp made with a (metal?) ring (Article III), both rare examples of a stamp-like impression. Some further examples of stamped tiles in the Near East, not numerous, come from Beirut, with a probable provenance in Cilicia and in Cyprus.²⁷⁶ This concerns only stamping of a civilian nature; stamping related to legionary *tegulae* is discussed on p. 96.

One element present in the assemblage of Ez Zantur in Petra is an additional ridge running between the flanges, some centimetres from one of the short edges and parallel to it (Article IV, 91; Fig. 13), recognized in both types but in slightly differing formats. This same element is present on the tiles from the Great Temple, Small Temple, the Theatre, and the Upper Market tiles (Article IV). However, it is not present in the later assemblages from Aaron (Article III) or the Petra Church, indicating a stylistic development over time that could well be followed in typology. Other examples of such a feature elsewhere in the Near East are not infrequent, as those from Jerash, and seem to indicate a common regional practice.²⁷⁷ Several examples show that such ridges were a prominent feature in tiles associated with the Cilician-based trade in clay coffins, from 1st to 4th c. CE.²⁷⁸ This trade extended down the Levantine coast as far as to the region of modern Israel, as well as to Cyprus²⁷⁹, and may have well provided models for later local adaptations of tile types. Mills records an additional “inset flange” from Beirut in some of the pan tiles²⁸⁰, and it is also present in the pan tiles from Kourion in Cyprus (1st to 4th c. CE).²⁸¹ The Cypriot tiles also display flanges that are turned and continued a short way along the lower short end of the tile (“flow directors”, a

²⁷⁵ Gerolimou 2014; see also De Domenico 2018 for Corinth before the Early Byzantine period.

²⁷⁶ Mills 2013, 58-63; Gerolimou 2014, 341-342.

²⁷⁷ Ebeling forthc. with references.

²⁷⁸ Lund 2015, 176-177.

²⁷⁹ Parks and Neff 2002, 209.

²⁸⁰ Mills 2013, 31.

²⁸¹ Huffstot 1987; Rose 2005.

feature uncommon in the Near Eastern tiles but clearly a defining one in Cyprus).²⁸² Ridges are also recorded on Byzantine tiles of type VI, in Gadara and near Tell Keisan.²⁸³

It has not been possible to fully trace the history of this element of roof tiles in the eastern part of the Mediterranean within the scope of this study. It is clearly an interesting element, and would merit a more thorough study. However, some general remarks will be made here. Winter does not provide examples of ridges in the Archaic Corinthian types in the Greek mainland, but examples of such a feature can be found from Asia Minor,²⁸⁴ suggesting that it may have been an eastern innovation created in the process of diffusion and development of the pan tiles in this area. However, the later Classical and Hellenistic examples of flat-panned tiles from Greece show that ridges as surface features are also included in the tile forms at some point there.²⁸⁵ Wikander records that this feature is present in varied forms in Greece, Asia Minor, and Southern Italy from the 7th century into Hellenistic times.²⁸⁶ It is also repeated in the Roman-period Corinthian-style tiles from Knossos (see Fig. 12), as well as on the 2nd c. CE Corinthian-style tiles from the Agora of Athens²⁸⁷, making it both a widespread as well as a long-lived feature.

It would be tempting to associate these ridges typologically with the ridges in the Ez Zantur and general Petra material, and see them as a vestige of the Hellenistic Anatolian types used earlier in the Hellenized area of the eastern Mediterranean. As a feature, it finds its area of occurrence in the East. In particular, it should be noted that ridges do not appear in the tegulae-type tiles of the western Empire, either in civilian or in military contexts. This issue is further discussed in Ch. 3.2.

Fabric

It is generally agreed that fabric, i.e. the combination of clay paste and possible tempers, is a necessary element in categorizing objects of plain terracotta that have few distinguishing features, such as coarseware and amphorae. This same principle clearly applies to terracotta roof tiles. The clearest categorization is achieved by scientific analysis, which is preferable but not always possible. The traditional approach of using hand specimens with 20x

²⁸² Huffstot 1987, 266.

²⁸³ Landgraf 1980, 87; Vriezen 1995, 31.

²⁸⁴ Winter 1993, 252, 271; Zimmermann 1990; Åkerström 1966, 15 (Assos) and 190 (Boghazköy). The Archaic/Phrygian tiles from Gordion do not have this feature (Glendinning 2005) but the later Hellenistic ones from the same site do (Henriksson and Blackman 1999).

²⁸⁵ Jones *et al.* 1962, 84, Corinthian-style tiles from Peloponnesos; Cujpers pers. comm., Corinthian-style tiles from Classical Olythos; Sarantidis 2015, 113-114.

²⁸⁶ Wikander 1988, 208, note 59: type C2.

²⁸⁷ Thompson 1950, 51.

enlargement was used with these assemblages. A partial analysis of the fabrics for chemical components is presented in Article II, which in general follow the archaeological categories and identified fabrics, excepting the colour. Other fabric definitions are presented in the articles and will not be repeated here.

The fabrics of roof tiles have already proved to be important in typologies developed in previous studies. One clear example is Philip Mills' work on the roof tile fabrics from Carthage and Beirut, which helped to categorize the assemblage and demonstrated that an extensive trade network was used for the procurement of this material, usually assumed to be local in provenance. Tile fabrics have also helped categorize Cypriot tiles,²⁸⁸ and Vindonissa Roman *tegulae*.²⁸⁹ The results from Paliambela show that the clear typological difference between the Laconian-style tiles termed Late Roman and Early Byzantine, visible also in hand specimens, is repeated in the chemical provenance of the tiles, and otherwise the fabrics are well in accordance with the archaeological types identified by the other elements outlined above. On the other hand, the original categorization of the Paliambela hand specimens into two different fabric groups was not sustained by the analysis, clearly demonstrating the potential for errors in categorizations based on hand-specimens only.²⁹⁰ A proper fabric identification would require both petrography and chemical component-based categorization.²⁹¹

Typologies with fabrics as defining elements can be intrasite, as was done in Paliambela (Article II). However, the ultimate goal would be to link them together with fabrics identified in other assemblages, to define production and diffusion areas for specific types. In the case of these assemblages, it was not possible to link the fabrics to any of the major groups available, excepting a tentative link made in the Monastery of Aaron between the tile fabrics and the local coarseware pottery fabrics (Articles III and IV). One reason for this is the still limited understanding of regional coarseware fabric types, both in Greece and in the Near East; another was the limited resources available in this study for fabric analyses. However, Mills' analysis of the fabrics in Beirut showed good links between fabrics and tile types, and provided descriptions and images of the fabrics. Fabrics were also described in Gadara and used in the categorization of tile types.²⁹²

In Beirut, Mills has suggested that some of the fabrics, especially BER2, had a wide regional distribution and a suspected origin in Cilicia. He further suggests that the fabrics from Tell Keisan and Gadara belong to this same category and also share the same origin.²⁹³ This is at least partially supported by the typological assessment of the Tell Keisan and Gadara tiles, although the

²⁸⁸ Rautmann *et al.* 1999.

²⁸⁹ Giacomini 2005.

²⁹⁰ See Whitbread 1991 for analysis of this tendency.

²⁹¹ Montana 2017.

²⁹² Vriezen 1995.

²⁹³ Mills 2013, 56.

suggested area of Cilician distribution seems quite extensive, and reaches far inland in the case of Gadara. I have chosen not to attempt associating the fabrics in the Petra area with the fabrics recognized in Beirut, and indeed the tentative indication is that in Petra the tiles are predominantly of local production. In general, my basic approach is to treat any fabric categorizations on equal footing with typological categorizations and temporal limits. My understanding, based on what I have recognized from other elements relevant for a tile typology, is that a better typology will be achieved by combining a detailed form-based typology with any identified fabrics.

* * *

This short overview of the changes observable in tiles which have traditionally been grouped into the general categories of Laconian or Corinthian tiles indicates that there are elements that support the breaking down of these groups into smaller, possibly datable groups and segments. In addition to fabric categorizations, meaningful elements include variations in shape (tapering), decoration and surfaces, fitting devices, and size. In the Laconian-style tiles in particular, towards the Late Roman period the use of fingerline signatures presents a very interesting possibility for classification. On the other hand, both the profile of the pan and the development of the flanges should be more closely analysed in order to determine whether they are features that can be used in constructing typologies. In the Roman-period tiles in the Near East, the development of cut-outs and ridges was especially meaningful in this material.

It should be emphasized that in all cases, datable contexts should be used to assign the tiles a dating bracket, notwithstanding the difficulties outlined above for dating the assemblages. Categorizations based on form alone do not constitute a typology in the sense expected here.

Returning to the question of the typology of the Laconian-style tiles in Paliambela, do the changes observed mean that we should regard Late Roman Laconian-style tiles as a typologically separate entity from the tradition of Laconian tiles? First, we should remember the convention set by Skoog of naming any tiles that do not belong to the eponymous systems as “Laconian-style” tiles instead of “Laconian”.²⁹⁴ This already separates the tiles into a distinct category from the Archaic Laconian tiles. Further, there are enduring elements in the Laconian-style tiles, primarily the curving profile of the tile, which aid in the recognition of the tiles as belonging to a shared tradition. The type was also in continuous use, and there is no question for example of a revival of ancient roof tile types in the Roman period. It is also interesting to note that in Greece the systems seemingly were not mixed at any point; e.g.

²⁹⁴ Skoog 1998, 129.

hybrid systems seemingly do not appear in Greece, although documentation of entire roofs is very rare.

All of this supports seeing Laconian and Laconian-style tiles as belonging to one larger typological group. However, by the Early Roman period, so many elements in the tiles have developed further that the tiles are well recognizable as “Roman” tiles (Article I, 42-45). I therefore suggest that using the term Laconian is also suitable for the tiles of the Roman period, acknowledging that we are talking about the same tradition of tile forms. However, as some kind of distinction should be made to separate the Roman period tiles from the decorated Archaic tiles belonging to that very specific roofing system, I have chosen to use the term Roman Laconian-style tiles, to denote the later tiles with their specific features. This seems sufficient, and a new typological category need not be suggested at this point.

The issue is not as clear-cut for the tiles in Petra. First of all, we know much less about the arc of development of tile types in this area, and there are extensive temporal gaps in the evidence. Secondly, the area itself is much larger, and therefore presumably more varied in terms of object typology. Regardless, it seems clear that these Roman-period tile types in the Petra area do not fall under the types of Corinthian or hybrid tiles, which were the “root” types that entered Anatolia and Near East in the 6th century BCE. Desirous of making a distinction, and in the absence of better defined groups, I have termed this larger category “Hellenistic Anatolian” (Article IV, 104), to separate it both from Corinthian and Archaic hybrid systems, as well as from the Roman *tegula* system. This term is not very convenient, because these tiles are not limited to Anatolia, nor are they only Hellenistic, but it works at the moment as a shorthand for a group that would and hopefully will benefit from a more detailed analysis in the future. Its rationale is broadly based on its assumed formation period and area.

In all cases, it is clear from the evidence of these individual assemblages and the comparative published material that any tile types have, in addition to belonging to a broader tradition of a general form (e.g. Laconian-style, Corinthian-style, hybrid) a clearly regional, if not local character, excluding only some larger cities. In terms of typology, this means that we should expect a large degree of regional variation within one area or group, with clear implications for documentation and research. There are specific occasions where transregional types are evident, such as the area of Cilician and Cypriot exports seen in Beirut, but the assemblages studied here demonstrate a more localized development, with marked differences between nearby areas. I have deliberately left the term “regional” undefined here; it means different things in different areas. From the point of view of typology, however, this is an overall important distinction to keep in mind. In particular, it emphasizes that the formal categories of the Corinthian, Laconian or hybrid/Sicilian types are too schematic to provide suitably fine distinctions between the different types, obscuring valuable information. This has also been pointed out in other typological series, such as the “Levantine amphorae”, where loosely used

terms have hampered the understanding of the development of several regional families of amphorae.²⁹⁵

This analysis, combined with previous observations,²⁹⁶ further suggests that with better documentation and more material there is potential to further develop the typologies of Roman-period roof tiles in this area into more nuanced and effective tools for research. A specific requirement towards this would be the creation and/or availability of large enough datasets to allow for statistically valid conclusions to be reached, instead of using only single examples as representative of a feature at any given time.

3.2.2 TILE REGIONS IN THE EAST DURING THE ROMAN PERIOD: A HYPOTHESIS

Based on the previous chapters, and complemented by a review of published research, it is possible to present a preliminary regional typology of roof tiles in the eastern part of the Mediterranean during the Roman period. This hypothesis places the assemblages studied in a larger typological context and highlights the regional variation of roof tile types in the eastern part of the Mediterranean. It was made possible because of the transregional nature of the research, where variability across larger areas became visible. The data used best reflects the situation in the 4th to 6th centuries CE in Greece and environs, and the 1st to 5th centuries CE in the Near East, with an emphasis on the 4th to 6th centuries CE. The data on which this presentation is based is included in Articles I-IV, with full references cited there.

There are immediately several caveats in the presentation. The material available in published form is very limited, so any conclusions must be regarded as preliminary; and even when published, typological affiliation is not always easy to recognize. Moreover, the regions presented below are clearly not very rigidly defined, but overlapping, and are not as sharply defined as presented on the map. The review excludes Africa, as my research did not extend to that area, although a short summary is given. And thirdly, the level of detail is not representative of the regional variation, remaining on a too general level, mostly due to the limited nature of the information available. However, a general framework against which existing and future finds can be evaluated can be suggested. These tile regions are schematically presented in Fig. 15, which is a first map representation of its kind over the eastern part of the Roman Empire. The distinction from earlier representations, such as Wikander's and Åkerström's outlines, is that this concerns the Roman period and plain roof tiles, not the decorated systems of the Archaic and Classical

²⁹⁵ Reynolds 2005

²⁹⁶ E.g. Koskinas 2011.

periods.²⁹⁷ This presentation also goes some way towards highlighting the regional nature of tile production in this period, with the known exceptions included. The possible impact of trade on the studied assemblages is discussed in Chapter 3.3.1.

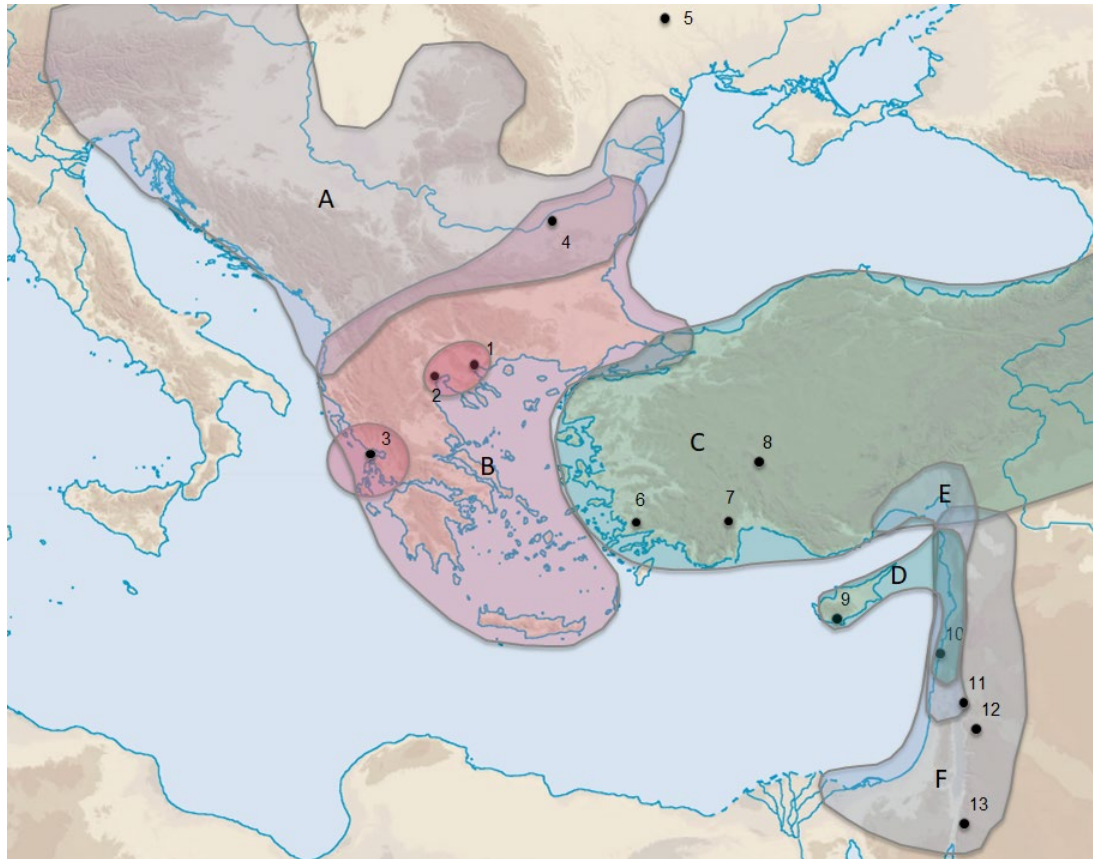


Fig. 16. A schematic map of roof tile regions in the eastern part of the Roman Empire in the (Late) Roman period. Areas = Tegula tradition, B = Laconian-style, C = Roman Asia Minor, D = Cypriot, E = Cilician, F = Near East general. Numbered points represent key and/or outlying findspots of representative tile types. 1 = Paliambela, 2 = Thessaloniki, 3 = Nikopolis in Epirus, 4 = Novae, 5 = Sobari, 6 = Labraunda, 7 = Sagalassos, 8 = Amorium, 9 = Kourion, 10 = Beirut, 11 = Gadara, 12 = Jerash, 13 = Petra. Base map: AWMC, CC BY-NC 3.0.

As seen from the map, distinct tile regions can be seen in the eastern area of the Roman Empire, and these are described below. This map needs to be read on two typological levels: on the level of the larger tile areas, and on the level of the regional variations within them. At the moment, only the first wlevel can be reached with any confidence, with some single areas on the second level, such as Epirote Nikopolis area, indicated. These macro regions presented on the map exist because the Roman-period tile regions continue to

²⁹⁷ Åkerström 1966; Wikander 1988. Despite their more general nature, both works remain groundbreaking and comprehensive compilations of the status of tile research at the time they were published. See also Mills 2013b for a general overview of tile areas.

follow the original systemic thinking. In practice, this means generally speaking that flat pan tiles continued to be combined with gabled cover tiles (Corinthian-style system), and curved pan tiles with semi-circular cover tiles (Laconian-style system) in the more western areas of the east, and flat pan tiles with semi-circular cover tiles (hybrid system) in the more eastern areas. It should be underlined here that from the point of view of typology and in light of this tradition of using established systems for tiling, it would be erroneous to see the flat pan tiles as Corinthian and semi-circular cover tiles as Laconian, unless they were combined with the correct pairs of cover and pan tiles.

Area I: Laconian-style tile region

The tile area of the Greek mainland and the nearby areas is an interesting zone, where the tradition of Laconian-style roofing lived continuously on from the Archaic period onwards, maintaining its regional importance and specific character into the Roman period. This is particularly significant as the surrounding areas had different and quite clearly separate trajectories in the development of tile traditions. This area is characterized in the Roman period by the dominant use of Laconian-style tiles, although the Corinthian-style system was also in use to a limited degree for specific buildings, possibly also regions.²⁹⁸ The core distribution areas of Laconian-style tiles in the Roman period were mainland Greece and the southern parts of the Balkans, which is not essentially different from its Classical distribution area. This system was also used in the main cities: certainly Thessaloniki and Nikopolis, possibly also Constantinople,²⁹⁹ although we are sadly lacking evidence for tile types used there. It has further been suggested that the hybrid system could also have been used in this area during the Roman period;³⁰⁰ as flat-panned tiles are not common, it will not have been a major element in tiling.

There are indications that, within this area, regional smaller distribution areas of Laconian-style tiles could exist. The general image presented by assemblages in this area was that, according to the element presented, variation between sites and assemblages were clear, indicating possible regional traditions (not to be equated with workshops). Some of these regions are already tentatively outlined in the presentation: that of Nikopolis; the area from Thessaloniki to Amphipolis, to which also Paliambela belongs; and possibly Thassos as its own region. It is estimated that similar micro-regions should be recognizable all throughout the area, when the amount of

²⁹⁸ See e.g. Sackett 1992 for Corinthian-style tiles in Roman Knossos; Corinthian-style tiles in Roman Corinth, Bookidis and Stroud 1997 and Slane 2017, Pl. 84; Corinthian-style tiles in Roman Athens, Thompson 1950.

²⁹⁹ Bardill 2004, Plate 1746.

³⁰⁰ Williams and Zervos 1989, 4-5.

documented material grows. This equals with the status of regional tile traditions in the Archaic period.³⁰¹

The Roman *tegula* does not seem to have penetrated into Greece, or did so in such a limited manner as to leave little discernible trace. Some of the Roman colonies in Greece stamped their tiles (partially) in Latin,³⁰² but it is unclear if these flat-panned tiles with stamps in Latin were *tegulae* or Corinthian-style pan tiles. There is an interesting transitional/buffer zone in NW Greece, in the regions of Epirus and Dalmatia, where the tile types used by the Hellenistic settlers were replaced by the use of Roman *tegula* in the Roman period. An indication that there might have been considerable Roman influence involved is suggested e.g. by the COS-stamped pan tile from the Early Roman villa of Aghios Donatos in Epirus.³⁰³ On the other hand, the Roman colony of Corinth continued to use Laconian-style tiles in parallel with stamping flat-panned tiles in Latin.³⁰⁴ Responses to the introduction of Roman *tegulae* were thus varied, and eventually the Laconian-style tiles came to dominate even those cities where Roman influence is most visible, such as Patras or Corinth.

The limits of these areas are not yet clearly defined, and may remain overlapping. Laconian-style tiles are attested from Late Roman Anchiasmos/Saranda in N Epirus (Article I) and in Stobi,³⁰⁵ whereas in Istria, *tegula* was already the dominant form.³⁰⁶ Stamped *tegulae* (e.g. Q. Clodius Amrosious tiles) were also in use in Dalmatia,³⁰⁷ and there are remains of wrecks carrying *tegula* cargoes down the Dalmatian and Illyrian coast to N Epirus.³⁰⁸ These liminal areas would be an important aspect to consider for further investigation of regions of use, especially in the Epirus/W coast transitional zone.

The provinces east and north of Greece had used the Hellenistic tile types in the Greek tradition, both Corinthian and Laconian. This area extended into the Bosphoros, where Laconian-style tiles became common by the Early Christian period.³⁰⁹ Again, this became an interesting liminal area in the Roman period, where traditions in roof tiling also co-existed. The strong

³⁰¹ Winter 1990

³⁰² Millis 2010; Gerolimou 2014, 318; De Domenico 2018.

³⁰³ Forsén 2011, 18.

³⁰⁴ Papaioannou 2002, 133. Williams and Zervos 1989, 4-5 and Plate 1, publish some "Sicilian" tiles from Roman Corinth that resemble Roman *tegulae*, and in particular both *risega* and *incasso* cut-out types. Slane later corrects the terminology to "Roman Corinthian", Slane 2017, 220. These tiles might represent attempts in technology transfer by Roman craftsmen (1st to 3rd c CE); both types are produced in Corinth.

³⁰⁵ Wiseman 1978.

³⁰⁶ Kompare 2016.

³⁰⁷ Wilkes 1979; Parker 2008, 185.

³⁰⁸ Parker 2008, 185-186; Royal 2012.

³⁰⁹ Billot 2010, 303-304.

Roman military presence from the 1st c. BCE onwards includes the introduction of (stamped) *tegulae*.³¹⁰ For example in Upper Moesia, Novae, both flat *tegulae* (with military stamps, such as Legio I Italica) and Laconian-type tiles with curved pans, dated to 3rd century CE onwards, are attested;³¹¹ Mills states that for Roman-period Bulgaria, the Laconian-style type dominates in roofing.³¹² An interesting example of a northern outlier is the cult site of Sobari in modern Moldova,³¹³ dated to the 4th century CE, where Laconian-style tiles were used hundreds of kilometres outside the Roman-controlled areas in the Barbaricum.³¹⁴ It seems evident in general that in the area of the Roman Lower Danube *limes* the substantial presence of the Roman military resulted in the dominant role of the *tegula*-type tiles, at least in certain areas with heavy military activity.³¹⁵

Area II: Roman Asia Minor and Cyprus

As stated before, the general understanding of Roman-period tile types in Asia Minor is fragmentary, and rests on published examples from single sites. In general, this area was characterised in the Roman period by the use of developed, simplified versions of the hybrid system, combining simple flat pan tiles with semi-circular cover tiles. This system seems to have been the dominant version in use. However, in the Late Roman and Early Byzantine periods, we find some examples of the use of Laconian- or Corinthian-style tiles at some sites in Asia Minor, such as the Laconian-style pan tiles in Amorium or the tile types present in the environs of Miletos.³¹⁶ In Sagalassos, roof tile styles are flat pans with either semi-circular or faceted cover-tiles, so a combination of Corinthian-style and hybrid systems; outside the city the main type seems to be the Laconian-style type.³¹⁷ Overall, both original Greek types remain an exception in Asia Minor compared to the hybrid system in its Hellenistic Anatolian format. It is certain that this picture of Roman Asia Minor can be drastically enhanced when more assemblages are published, and it is to be expected that large intra-regional variation occurred.

A particular type in (at least) coastal Asia Minor and also Cyprus were the already mentioned “shovel-like tiles”, tiles with flanges on three sides, including one short side. These tiles were first identified from the 7th c. CE

³¹⁰ Kurtzmann 2006, 109.

³¹¹ Sarnowski 1985, 22-25; Biernacki 2003; see also Mills 2013, 4.

³¹² Mills 2015, 93.

³¹³ I thank prof. Sergiu Matveev from the State University of Moldova for making me aware of this interesting site.

³¹⁴ Popa 2002, 272-273.

³¹⁵ Sarnowski 1997.

³¹⁶ Witte 2012, 308-309; Berndt 2003.

³¹⁷ Mills 2015, 93; Loots *et al.* 2000.

shipwreck site of Yassi Ada on the western coast of Asia Minor, and are often referred to as “Yassi Ada” type for this reason.³¹⁸ Although this type is absent from the tile assemblages studied here, it is a very distinct type, frequent in its area in the Byzantine period, and seems to be quite widespread. It is also found in the Near East (see above).³¹⁹ It thus forms a further type category of its own, and adds to the image of a regional variation in types.

In Cyprus, in addition to the hybrid system, both Laconian-style and Corinthian-style tiles were used in the Roman period, even on same sites;³²⁰ the concurrent use of tile systems on single sites seems not to have been an issue in general in antiquity.³²¹ Both of these types were also manufactured on the island. Without going into too much detail, the types on Cyprus display some very distinctive elements, such as the different versions of Corinthian-style tiles from Kourion.³²² It is evident that Cyprus was a strong producer of terracotta objects, including distinctive types of roof tiles, including for export, and there are several sites on the Levant coast and even inland where tiles with a probable origin in Cyprus have been found, based on the types found.³²³

Area III: Roman Near East

The third area comprises what in the 5th century CE was the Diocese of Oriens, from Cilicia in SW Turkey to Palaestina Tertia and the Red Sea in the south. This area is characterized in the Roman period by the general dominance of the hybrid type, reminiscent of that which developed in Asia Minor, and on the other hand the existence or occurrence of Corinthian-style tile variants with gabled cover tiles. Many of these seem to originate in Cyprus, although the picture is far from complete. Regional variation from city to city seems to have been great, and adaptations local in nature. No Laconian-style tiles that would date to the Roman period have been found in the area.³²⁴ The picture is complicated and not easy to define, as suitably well published examples of tiles are not numerous; but again, a preliminary picture of the situation as it stands at the moment is given here.

³¹⁸ Bass and van Doorninck 1982.

³¹⁹ Although this type is found in Byzantine contexts in Jerash, and in western coastal Asia Minor (see Berndt 2003), similar-looking tiles were found e.g. from Palmyra in 1st-c. CE contexts, see Michalowski 1962, 21, and from pre-3rd c. CE Zeugma, see Önal 2013, 26. These two examples are very similar with each other, including the circular fingerline signatures on the corners.

³²⁰ Rautman 2003, 254; Megaw 2008 for only Laconian-style roof.

³²¹ Wikander 1988; Mills 2013.

³²² Huffstot 1987.

³²³ E.g. Beirut; Tell Keisan; Gadara; also Horvat Kur in Galilee (P.Bes pers. comm.); Jerash (P. Ebeling pers. comm.).

³²⁴ Based on the literature survey; possible examples may have been missed but these would represent anomalies in the overall picture.

The tile assemblages from Petra show a development from simple Type 1 tiles in the 1st century CE (and possibly earlier) to the more varied Type 2 (Article IV), and further on to the Late Roman and Early Byzantine tiles used in churches (Article III). All of these were of the hybrid type in Petra, with simple flat pan tiles, usually with ridge, combined with semi-circular cover tiles, although the ridge seems to be omitted from the later types. Type 1 is common in the city, and was probably the first type to be utilized in Petra. Type 2, on the other hand, with its distinct features, suggests that local variation and thus more nuanced typological divisions are possible even in such marginal areas of tile construction. This regional importance is emphasised, as a similar roof tile type was also encountered in Roman Humayma/Hawarra,³²⁵ situated ca. 80 km south from Petra, presenting the possibility that this type may have had a wider regional diffusion. As stated before, these tiles are thought to be of local/regional manufacture in this area.

Further finds from the area include the flat-panned tiles from Gadara, of several types, which could be combined with either semi-circular or gabled cover-tiles, already demonstrating a difference in the types involved.³²⁶ The uncommonly abundant tile material from Jerash includes at least nine different pan tile types and three cover tile types, including Ez Zantur Type 1 plain tiles with ridges, but also Corinthian-style gabled cover tiles, as well as the “shovel-like tiles” with three flanges, which possibly represent the Yassi Ada type.³²⁷ A particular tile region also seems to have been concentrated around Jerusalem, where the types are otherwise reminiscent of the Monastery of Aaron material, but also include very specific stamping in civilian contexts.³²⁸ And again, tile types from Beirut show further differences from the assemblages in Petra: by the Roman period, the faceted Corinthian-style cover tile in use was replaced by the semi-circular cover tile of the hybrid type, but Corinthian-style tiles were deployed throughout the Roman period.³²⁹

Regional differences seem clear on the basis of comparisons of the Petra area, Jerusalem, Jerash, Beirut, and other sites. Among other reasons for this, one factor was the importing of roof tiles evident in Beirut and elsewhere. Although some tiles of the hybrid type were manufactured in the vicinity, many originated from Cilicia, which was a strong centre of ceramic production in this period, and distributed its products at least down the Levantine coast, as has been referred to before in connection with the export of clay sarcophagi. According to Mills, Cilician tiles are encountered e.g. in Ras-el

³²⁵ B. Burrell, pers. comm; Article IV.

³²⁶ Vriezen 1995; the material includes also very probably imported tiles from Cyprus with “flow directors”, see Hufstott 1987.

³²⁷ Ebeling forthc.

³²⁸ Seligman 2015, 168.

³²⁹ Mills 2015b, 90-91.

Bassit/Posideium, Homs, Beirut, and Tyre.³³⁰ The Corinthian-style tiles common in Beirut in the Byzantine period were on the other hand probably imported from Cyprus; Mills suggests this on the basis of the “soft yellow” fabrics that the Cypriot imports, which would also be diffused to Tell Keisan and Gadara further south in the Levant.³³¹ These imports are included in the presentation as micro-level regions in this area. The movement of tile cargoes, and the resulting diffusion and its relation to more localized production, is an interesting question needing further attention in this area.

Of the described tile types, this study suggests that the frequently occurring hybrid types, in particular those that are closest to the Ez Zantur Type 1 tiles with very simple features, ridges, and full flanges, have their origin in the later variants of the original archaic hybrid tiles, as opposed to being emulations of the Roman *tegula*.³³² There is justification in calling these “Hellenistic Anatolian” based on their probable entry into this area via Asia Minor, and the subsequent development of this type primarily during the Hellenistic period.

A note on Roman Africa

Although the types of roof tiles used in Roman Africa were not included in this study, some notes can be made on the situation there. In general, the amount of tiled roofs was not large even in the urban centres, and tiling was little used except in public buildings and some larger houses.³³³ Pitched roofs were not common in N Africa, where flat or vaulted roofs were more common.³³⁴ In Thamusida, the tiles are flat pan tiles with rounded shortened flanges and semi-circular cover tiles, probably of Italic origin and in the *tegula* tradition.³³⁵ These were, in addition to import, also manufactured locally in Thamusida, along with some coastal import from Tangiers.³³⁶ Russell states that the tiles used in N Africa were mostly imported.³³⁷ In Roman Carthage, the types in use are not described by type but by fabric, but seem to conform to the *tegula*

³³⁰ Mills 2013, 59; Mills 2015b, 88, 91.

³³¹ Mills 2013, 62.

³³² This is e.g. postulated for Hybrid tiles from Beirut, which Mills (2013, 94) places under a category called “Sicilian”. While it is not wholly ruled out that tile traditions in Beirut could have been affected by Roman traditions, it is more likely that the form conforms to the older, pre-conquest local Hybrid tile tradition.

³³³ Mills 2013, 98-99; Camporeale 2015, 145, 148.

³³⁴ Russell 2016, 174.

³³⁵ Camporeale 2008, 181; Camporeale 2015, 148 states that the Thamusida tiles are uncut at lower corners, but those from Banasa and Sala are of the *incasso* type of Italian *tegulae*, see Shepherd 2015.

³³⁶ Mills 2015b, 94; Gliozzo *et al.* 2011, 1036.

³³⁷ Russell 2016.

tradition of flat pan tiles and semi-circular cover tiles.³³⁸ Whatever forms of tiles had been used in the Punic period – and it has not been possible to research these – they were supplanted with the *tegula* with the Roman conquest of Africa.

A note on Roman (military) *tegulae*

One final note should be added, and this concerns the use of Roman *tegulae* in the eastern provinces. These are related to the permanent or more long-term presence of the military, and the practice of the army to produce its own building materials, and thus concerns only specific areas and sites.³³⁹ One example of such a situation in the eastern extremes of the Empire are the forts and garrisons in Judaea and Arabia, such as the Legio X Fretensis camp in Jerusalem, where *tegula*-type tiles stamped with legionary devices have been found.³⁴⁰ Another example comes from Legio, the camp of Legio VI Ferrata in Judaea. Interestingly, these legionary tiles from Legio (or at least the one example illustrated) display the upper and lower cutaways of a *tegula*, but also include a ridge near the upper short end of the tile; an element not usually found among the western *tegulae*, but frequently in the Hellenistic Anatolian type discussed above.³⁴¹ This is an example of adaptable production contexts, where local influences could infiltrate even such a standardized production.³⁴² Recent research has also suggested that the Roman army contracted the production of bricks and tiles for the southern *Limes Arabicus* out to local Nabataean workshops, possibly even those at Petra.³⁴³ On the other hand, the legionary kilnworks in the region seem to display features that could point to an unusual consumer demand, such as civilian consumption.³⁴⁴ At the moment, we lack further studies that would help clarify the relationship between military and civilian production of tiles in this area during the Roman period, but they seem to display typologically very different choices and traditions (Article IV, 106).

³³⁸ Mills 2013.

³³⁹ See Kurzmann 2006, 142- for sites used by army units; only Jerusalem, Zeugma and Bostra are included in her lists of stamped products in the Near East. See Murphy *et al.* 2018 on legionary ceramic manufacture conditions in the area.

³⁴⁰ Arubas and Goldfuss 1995

³⁴¹ Tepper *et al.* 2016, fig. 20. This ridge feature can also be found on the *Legio VI Ferrata*-stamped tiles from Horvat Hazon (see Bahat 1974), although the presence of cut-outs cannot be determined from the published examples.

³⁴² See Murphy *et al.* 2018, 462.

³⁴³ Harvey 2018.

³⁴⁴ Murphy *et al.* 2018, 461-462.

This chapter has outlined how, based on the assemblages studied and related finds, we can start suggesting typological areas of tile traditions in the eastern part of the Roman Empire. Out of necessity, this outline is based on an insufficient number of examples, but should still illustrate the macro regions visible, as well as pointing towards the existence of more nuanced regional typologies.

The traditions outlined here were fundamentally based on the tile systems developed in Greece in the 7th c. BCE, with a trajectory of diffusion and development eastwards to Asia Minor and the Near East. Only by the Byzantine period - sometime after 700 CE but with too few dated examples to be sure of a more precise dating - are these traditional forms, already a millennium old, replaced by distinctly different, coarser, smaller, more crudely formed roof tiles in the Greek area.³⁴⁵ In the Near East, the Umayyad conquest of the 7th c. CE brought with it a return to the more traditional architecture and roofing methods, such as vaulting and arch-based flat roofs. However, tiles continued to be used on some specific buildings, at least during the early Islamic period.³⁴⁶

3.3 ROOF TILES IN PRODUCTION AND USE CONTEXTS

The last major research question of the study is related to the crafts dimension of the tile industry. The following paragraphs summarize what the assemblages were able to reveal about issues relating to tile production and distribution. It further highlights results relating to the finger line signatures that were a significant part of the Paliambela assemblage. Finally, it briefly discusses thoughts on eastern roof tiles in their Roman-period social contexts, such as being part of a changing material culture, as well as parts of the built environment.

3.3.1 PRODUCTION SITES, CONDITIONS AND PROVENANCE

This chapter summarizes what is deductible regarding the production and distribution of roof tiles from the assemblages involved. The research carried out for this project, for the most part, did not directly concern itself with these

³⁴⁵ Skoog 1998, 16; Megaw 2008; Kontogiannis 2008; Koskinas 2011, 562.

³⁴⁶ See e.g. Walmsley and Damgaard 2005; Cytryn-Silverman 2009.

questions, but regardless touched on related issues, such as the process of tile production and questions related to supply.

Local, regional, or imported?

In light of the assemblages studied, it can first of all be stated that tile production, at least the assemblages from Paliambela and the Monastery of Aaron, was local. In the case of the Monastery of Aaron, it was not at all evident that such materials as terracotta roofing tiles, which were not common in Petra and had to be in any case separately transported to the mountain, would be of local origin (Article III). However, the tiles analysed in connection with the provenance studies of the Monastery of Aaron pottery assemblage clearly indicate a local provenance for the tiles (Article IV).³⁴⁷ This remains the more likely explanation, even in light of the demonstrably far-reaching tile trade down the Levantine coast from Cilicia and Cyprus.³⁴⁸ In addition, the presence of Nabataean letters on the tile surfaces also supports the idea that production was taking place in the region (Article IV, 100).³⁴⁹ The provenance of the tiles in the Ez Zantur assemblage cannot be accurately determined, as it is a mixed assemblage, with no provenance analyses made on the fabrics. However, it is suggested in Article IV that these tiles could also be of local origin (Article IV, 104).

For the Paliambela tiles, we also lack a direct indicator of provenance. However, this production is also most likely local, and the chemical analysis carried out (Article II) indicates a common provenance for the material. In the period when the tiles were manufactured (5th c. CE) there was extensive ceramic building material production in the area in several sites, from Thessaloniki to Amphipolis (Article IV). A workshop somewhere close to the site would be a logical point of origin for the tiles, but currently no kiln sites are known nearby Paliambela.³⁵⁰ I suspect that this is more related to our lack of knowledge than reflecting the contemporary situation, particularly as there are suitable clay areas within a reasonable radius from the site.³⁵¹ A production unit situated directly on the site of the basilica, which could theoretically have

³⁴⁷ Holmqvist 2016.

³⁴⁸ Mills 2015a.

³⁴⁹ Wikander (2017, 205) points out that the presence of letters on tiles does not necessarily imply literacy among the tilemakers, even if they could be connected to individual craftsmen; it could also be a questions of emulating relatively simple model figures.

³⁵⁰ The closest known Roman-period kiln sites capable of tile production in the area are from Thessaloniki, from Vassilika and Stratoni in Halkidiki (see Hasaki and Raptis 2016, 216), and from Amphipolis (ca. 30 km east from Paliambela, Malama 2003). At least one brick used in the Paliambela church was probably manufactured using the same mould as the bricks used in Amphipolis, see Article I, 64.

³⁵¹ Theocharidou 1988, 99; see also Article II, 18.

served the site,³⁵² is in the case of Paliambela ruled out, due to the site's location in a sloping, ravine-surrounded stretch of the countryside; additionally, no such remains were identified in the survey of the site.³⁵³

One interesting point in assessing the local or non-local nature of the assemblage in Paliambela are the tiles that were identified tentatively as “Early Byzantine” (Article I, 57-59). These differ considerably from the majority of the tiles in form, but also in their different fabric, which was fine-grained and light beige. As suspected, these tiles were made of a fabric that is highly calcareous (Article II, 13), which cannot be local as there are no calcareous clay deposits around Paliambela or Thessaloniki. A tentative suggestion was made in Article II to connect these tiles to tile production in Thasos, where calcareous clays exist.³⁵⁴ This could also suggest that regional trade in ceramic building material took place in the 6th c. CE in this area.

In general, after some decades of discussion on the nature of tiles as a trade commodity, it is generally agreed that regional trade in roof tiles as primary cargoes did take place, attested mainly by evidence from shipwrecks, fabrics, and tile stamps, in at least some regions of the Mediterranean, such as between Rome and N Africa, along the Spanish coast, along the Ionian Sea coast/Dalmatia, and along the Levantine coast.³⁵⁵ Tile distribution was therefore not such a solely local enterprise as has sometimes been proposed, especially in earlier research, and cannot be explained only based on cost-benefit analysis.

Manufacturing processes

The assemblages in Paliambela and Petra displayed a number of details that could be linked to the process of manufacturing roof tiles. These processes have been described in detail,³⁵⁶ and a discussion of these is also included in Articles I and III. Only the most important methods will be highlighted here.

The pan tiles in the assemblages from Paliambela and the Mountain of Aaron, and those of Type 1 in Ez Zantur, had smoothed upper surfaces and rougher undersides, indicating that the slabs of clay had been placed on the sanded work surfaces with their upper surfaces facing upwards, a standard method in pan tile manufacture. Flat pan tiles were usually produced with the help of wooden frames, and in some cases the outer surfaces of the flanges show the extent of these frames as indentations, as shown in the Monastery of Aaron material (Article III, 378) for at least some of the tiles. The shaping of

³⁵² Mills 2015b, 90.

³⁵³ Pettersson and Karivieri 2017

³⁵⁴ Whitbread 1991.

³⁵⁵ Mills 2015b, 88; Lancaster 2015a, 240; Russell 2016.

³⁵⁶ E.g. in Wikander (1993, 2017), Theocharidou (1988), Shepherd (2006, 2007), Warry (2006), and Clément (2013).

the flange may have happened with the help of the frame or by adding extra clay to a slab;³⁵⁷ the double-thickness flanges in the assemblage of Aaron suggest that these flanges were formed by doubling over the long edges of the slab (Article III, 379). The tiles were then left to dry to leather hardness and fired, both of which steps in the process left their marks on the tiles (Article I and III).

On the other hand, the tiles of Type 2 from Ez Zantur had distinct markings in relief and a rippled clay surface on the upper pan, which are hard to explain in any other way except that they were produced in an inverted mould (Article IV). Although only practical experiments, such as have been done with Archaic Corinthian tiles, could corroborate this theory, it remains a distinct possibility.³⁵⁸ That pan tiles could be mould-pressed is demonstrated by the contemporary Cypriot tiles with relief stamps/figures on their top surfaces, as well as by examples of inverted mould use from Britain.³⁵⁹ Mould-pressed bricks with relief stamps are present in the Monastery of Aaron material (Article III, 381), so the technique was generally known in the area.

We do not know for certain how the Laconian-style pan tiles were manufactured, or how the curved shape was achieved. Curved cover tiles were manufactured over convex moulds, and wider convex moulds could have also been used for the pan tiles.³⁶⁰ However, this is not immediately compatible with the order of the smoothed and rougher upper and lower surfaces of the tiles, nor with the fingerline positioning on the upper surfaces. The studied assemblage does not provide more information on this, except to demonstrate that the tiles were bent somehow, that they were slipped on the upper surface, and lifted at some stage as slabs, as the accidental finger depressions on the edges show (Article I, 44-45). It is possible that an inverted concave mould was used, and Gerolimou also suspects as much.³⁶¹ It is probable that the tiles were placed to dry standing up on their short edges, which certainly must have been almost necessary for the curved Laconian tiles.³⁶²

The firing of the tiles in kilns is generally well attested by examples elsewhere, either in kilns designed solely for ceramic building materials or for mixed loads such as amphorae and pottery. The assemblages do not contain direct evidence of kilns or firing methods, as they represent use contexts instead of production contexts. Moreover, no kilns could be directly associated with the assemblages. However, all assemblages exhibit good-quality, well-fired tiles, especially that in Paliambela. An initial assessment was made in Paliambela that the different colours of certain tiles could denote different

³⁵⁷ Ebeling forthcoming.

³⁵⁸ Sapirstein 2009.

³⁵⁹ See Mills 2013, 64 for examples from Beirut. Britain: Warry 2006, 8-9.

³⁶⁰ Sapirstein 2016, 57 suggests as much for the Archaic Laconian pan tiles, as does Skoog 1998, 127.

³⁶¹ Gerolimou 2014, 319.

³⁶² See Wikander 2017 for drying tiles in an upright position.

fabrics, which turned out not to be the case (Article II). This result, supported by previous studies, suggests that smaller variations in tile colours are the result of the firing process rather than earlier phases of the manufacturing process.³⁶³

Workshop organization and workforce

The question of how the tile industry was organised in the eastern part of the Roman Empire is an intriguing one, but also one that cannot be answered with the evidence under consideration in this study. The find contexts represent, as stated, contexts of use and not of production, and supporting evidence from this period and area is relatively scarce. Some general observations that are relevant can however be made.

First of all, although we have good evidence for the organization of the Roman tile and brick industry from the environs of Rome itself,³⁶⁴ this evidence cannot be transferred elsewhere, simply because of the singular nature of the brick and tile industry in the capital. Production technology was probably much the same, but models of organization must have been different, being dependent on the vast volume of building, the existing market, and the complex connections between brick and building industries in Rome.³⁶⁵

Sources concerning the organization of contemporary building-material workshops in the eastern part the Roman Empire are scarce.³⁶⁶ Some tile and brick workshops and kilns are however known from Greece;³⁶⁷ the closest and best evidence comes from Thessaloniki, where a number of tile and brick kilns have been excavated outside the city walls (Article II).³⁶⁸ In Thessaloniki, ceramic building materials clearly formed a significant part of local economy; another large-scale production centre in the area was Constantinople.³⁶⁹ One indicator of the level and complexity of production in these specific areas is the practice of stamping the products, which picks up in these areas from the 4th century CE onwards.

The local nature of tile production for the assemblages discussed has already been demonstrated. It is also evident that production took place in small units. Even those kilns or workshops known from Thessaloniki were small enterprises, although there is not much evidence for the operation or ownership of these workshops.³⁷⁰ There are indications that the workshops

³⁶³ Whitbread 1995

³⁶⁴ E.g. Steinby 1993.

³⁶⁵ Manacorda 2000, 140; DeLaine 2015, 226.

³⁶⁶ Theocharidou 1988, 111; Ousterhout 1999, 131; Gerolimou 2014, 306.

³⁶⁷ Gerolimou 2014, 332-333; Hasaki and Raptis 2016.

³⁶⁸ Raptis 2015.

³⁶⁹ Gerolimou 2014, 334 for Thessaloniki; Bardill 2004 for Constantinople.

³⁷⁰ Raptis 2015.

were more privately-operated than state or civic enterprises, such as the local operation that has been demonstrated e.g. for Epirote Nikopolis.³⁷¹ The workshops in the Thessaloniki area were one-kiln operations; an example of how a more rural production site, such as could have existed in the Paliambela area, might have looked is the small kiln found in Vassilika in the environs of Thessaloniki.³⁷² The presence of cross-decorated bricks might indicate that some of the ceramic building-material production took place on church-owned property or with church resources (Article I, 71).³⁷³

For the Petra area, there is also evidence for pottery kilns which produced tiles in addition to pottery (Article III and Article IV). In the Zurrabah area slightly outside the city, there are several kilns in a row, suggesting that this production was of a semi-industrial nature (Article III); certainly the production of painted Nabataean pottery was a large-scale industry in Petra.³⁷⁴

Article II outlines the different possible scenarios for the production of the Paliambela tiles, and the estimated potential output; the meaning of signatures in this context is discussed in the next chapter. In general, it should be noted that even a small establishment could under good conditions produce a significant amount of tiles; roughly estimated, a small workshop unit, working seasonally, could have produced a more than sufficient amount of tiles for a typical church within one season (Article II).

We have almost no evidence at all from the assemblages of the workforce that produced the tiles, and there is little available evidence on this topic in related research or ancient sources. The workforce in the smaller tile workshops of the eastern Roman Empire was probably a mix of free citizens and slaves, family and hired hands. Women and children could also have been included, based on the physical traces they have left on the tiles and bricks in the form of footprints and finger marks.³⁷⁵ Even in Paliambela, the finger line signatures are in some cases drawn with relatively narrow fingertips; it is therefore not excluded that the production units in this area were also utilizing women or children as part of the workforce.

The production of roof tiles was a craft that required some skill and specialization. One piece of evidence for this is the specialist nomenclature attached to these craftsmen in ancient sources.³⁷⁶ The industry was sufficiently specialized that even travelling craftsmen existed. The movement of tile makers within their own market areas has been demonstrated in Roman Britain, and it is assumed that the early tile traditions in Greece were

³⁷¹ Gerolimou 2014.

³⁷² See Hasaki and Raptis 2016, 216, no. 44.

³⁷³ Rather than suggesting that the bricks were destined for church construction, see also Mills 2013.

³⁷⁴ Schmid 2007, 323.

³⁷⁵ Anderson 1997, 151-166; Balielo 2017.

³⁷⁶ See e.g. Orlandos 1966; Drexhage 1994.

transmitted through the medium of itinerant craftsmen.³⁷⁷ In the case of Petra, Article IV suggested that the earliest tile craftsmen there may have been travelling tile craftsmen who arrived from Alexandria after the dissolution of the Ptolemaic kingdom (Article IV, 104).

Distribution and consumption

Another area for which we have little evidence are the processes involved in moving tiles from the place of production to the place of use. In the case of assumed local production, the transport distances might not be long, but the processes are still largely unknown.³⁷⁸ It has however been clearly demonstrated that both in Paliambela and in the Mountain of Aaron the production did not take place in the immediate vicinity of the site. The more probable model for both of these areas is a semi-local private workshop producing tiles on demand for individual building projects (Article I, II and III).

The clearest evidence of a distribution-consumption pattern in the assemblages comes from the analysis of tile origin carried out in Paliambela (Article II), which indicated a common provenance for the tiles used in the roofing of the church. Based on the research presented in Article I, it is probable that the tiles analysed were from a lot of tiles commissioned for the construction of the church, and clearly derive from one and the same source/workshops, the location of which could however not be pinpointed (Article II). Alternative sourcing channels could have involved the use of warehoused material; the warehousing of ceramic building materials is clearly evident for example in the huge market of Rome.³⁷⁹ The stockpiling of roof tiles is indicated e.g. in the Early Byzantine church of Edessa, a very contemporary and close parallel for Paliambela (Article I, 43), as well as in the Galerian complex in Thessaloniki for 7th c. CE construction, and in Gerasa cathedral in Jordan.³⁸⁰ However, the examples of stockpiling presented here seem to be better linked to local stores of reclaimed or reparation material rather than a “builder’s market” type of warehousing.³⁸¹ The common provenance of the material rules out the use of warehoused or recycled material in Paliambela (Article II, 69). However, as stated already in Chapter 3.1, the recycling of building material in general remains a very common phenomenon in this period and area, and is also evidenced in this study in other contexts.

³⁷⁷ Mills 2015b, 90 for Britain; Skoog 1998 for Archaic Laconian tiles.

³⁷⁸ See Pelever 2016 for a case study from Britain, where brick and tiles were transported over longish distances, up to 50 km, with ox carts.

³⁷⁹ Bukowiecki 2012.

³⁸⁰ Thessaloniki, for bricks; Gerolimou 2014, 265; Athanasiou 2006; Gerasa/Jerash Clark 1986.

³⁸¹ For a “builder’s market” for ceramic building materials in Roman Britain, see Warry 2017.

In relation to distribution and consumption, a note on the value of tiles is in order. The contemporary evidence, as limited as it is, provides astonishingly high figures for the price of tiles and the wages of the workmen, indicating that tiles were not an especially cheap commodity.³⁸² Mills argues that its value as cargo equalled that of wine and other relatively costly commodities, also impacting our conception of tile as cargo.³⁸³

3.3.2 THE TILE ROOF AS A TECHNICAL UNIT

Research presented in the articles also touched on a number of technical details related to how the tiled roofs were constructed. These are summarized below for the roof elements in general, as well as for the technical details visible in the tiles themselves.

As a technology, tiled roofs had some technical advantages over other roofing solutions then in use. First of all, ceramic tiles were fireproof, a definite advantage also mentioned by ancient authors, and essential in the urbanization process both in Rome and in the eastern part of the Mediterranean (Article IV).³⁸⁴ Secondly, they were waterproof, which was doubtless an important factor in the adoption of roof tile, at least in Italy, in the provinces north of Italy, and possibly also in Greece.³⁸⁵ This characteristic had the biggest impact in areas where precipitation was high, possibly also including regions with snowy winters, so environmental factors may have been deciding factors in the adoption of this technology in such areas (Article IV).

A general starting point for considering the technology of tiled roofs is that they were pitched, either single (mono)-pitched or gable roofs with two slopes. The tiles in this material came from clerestory roofs, and possibly single-pitched atrium portico roofs in Paliambela (Article I), and from the clerestory roofs or gable roofs of the Monastery of Aaron church (Article III). We have no direct evidence for which kinds of roofs the fragments collected from Ez Zantur House IV originally came from, but an analysis presented in Article IV showed that tiled roofs were used in Petra city in some of the gabled roofs of the temple porticoes, in one wholly gabled temple roof, and in the single-pitched roofs of the Colonnaded Street, the Upper Market, and the Great Temple portico (Article IV).

A second generic technology or method related to tiled roofs is that the tiles need to overlap in order to create a waterproof roof surface. This is achieved in the Roman period by the tiles abutting one another in one horizontal row, and overlapping the row below (see Fig. 1 for a tiled roof). This overlap was helped in the western Roman *tegulae* by fashioning both the lower

³⁸² Wikander 1988, 206; Drexhage 1994.

³⁸³ Mills 2015b, 89.

³⁸⁴ Anderson 1997; Lancaster 2015b, 193; Oleson 2010, 264.

³⁸⁵ Shepherd 2007.

corners of the lower end and the upper corners of the upper end with cutaways (see Fig. 3 for tile components). However, the tiles of the eastern tradition usually did not employ this fitting format, or used it differently.

The material used in this research included a representative selection of devices for easing the tile overlap, and this varied between the Laconian-style tiles in Paliambela and the flat-panned tiles from Petra. No cutaways were observed in the Laconian-style tiles examined in Paliambela (Article I), nor are any such devices mentioned for the Archaic original types.³⁸⁶ Article I assessed the way the tiles were fitted on the roof, and based on the traces in the tiles, this was achieved only by utilising the curve of the tiles and mortar as a binding substance (Article I, 45). As the profile of the tiles was varied in curve, this meant that the fit was not as interlocking as in the Roman *tegula*, necessitating a liberal use of mortar. On the other hand, this fitting system allowed for less modularity in the tiles. Whereas *tegulae* needed to be almost exactly identical in size in order for the corner interlocking system to work,³⁸⁷ there could be more variability in tile metrology in the Laconian-style system. In fact, the presumably contemporary Paliambela tiles show a variance up to 0,05 m (Article I, 68), which would not have been viable for tiles with interlocking parts. In this system, the amount of overlap could also be adjusted (Article I, 46).

Mortar was used in the Laconian-style system in Paliambela, at least in the area of the pan tile overlap, and under (also possibly over) the cover tiles (Article I, 46). There seemed to be no other fitting devices employed, such as nailing the tiles, which Wikander estimates was anyway becoming rarer towards the Roman period.³⁸⁸ There is a possibility that iron brackets were used for the lower register of tiles, as these were found on the site (Article I, 46). As for the underlying construction that supported the tiles on the roofs, known possibilities include plain rafters, an underlying planking, or a planking covered with a clay or mortar bed; in this case, the placement on plain rafters was suggested (Article I, 46).³⁸⁹

The tile material from Petra demonstrated a different approach to fitting the tiles on the roof. To start with, these tiles were flat in profile, with square flanges. Despite being similar to the Roman *tegula* in format, they did not share the fitting device of corner cutaways of this type, very likely due to their genealogy as Greek-Hellenistic types, as discussed in Chapter 3.2. In the Ez Zantur Type 2 and the Monastery of Aaron tiles, the flanges were shortened from the upper short end of the tiles (Article III, 380). This did not provide for interlocking as such, but did allow the tiles to overlap more comfortably.

In contrast, the earlier type in Ez Zantur (Type 1) had no shortening of flanges nor any other visible devices for allowing the tiles to overlap (Article

³⁸⁶ Winter 1993; Skoog 1998.

³⁸⁷ Clément 2013, 118.

³⁸⁸ Wikander 1988, 208.

³⁸⁹ See Winter 1993, 307 for a technical discussion; see also Hodge 1960.

IV, 91), excepting a ridge on one short end on the upper surface. If and when these tiles were used on roofs, it is not clear how the necessary overlap worked, as identified in Ch. 3.2. One possibility is that the tiles were placed on the roof abutting on all sides, level with each other and not overlapping. This method is visible in the supporting structure of the hypocaust room shown in Fig. 9. Petra, with its limited amount of rainfall, might have been able to employ tiled roofs without an overlap, which was designed to make the roofs more waterproof and facilitate water runoff. This kind of arrangement certainly necessitated the use of mortar to water- and windproof the seams between tiles. Although this arrangement remains hypothetical, in general mortar was in liberal use in Petra, at least in the Monastery of Aaron, as was shown based on the material (Article III, 381). The mortar that is visible on the tiles from Ez Zantur could derive from the phase when they were reused in the masonry, and so cannot be distinguished from the use of mortar from the phase when the tiles were used on the roofs.

The fitting of tiles on the roofs generally achieved a symmetrical surface of alternating pan and cover tiles. The vertical rows in particular needed to be aligned. However, it should be noted that the very regular reconstructions usually presented in publications do not correspond well with the practical reality of ancient tiled roofs. First of all, research in Paliambela showed quite clearly that the cover tile length was shorter than the pan tile length, with the overlap being equal to the pan tiles. This meant that the sequence on the cover tile joints in the vertical row was not the same as the sequence of the horizontal pan tile rows (Article I, 43). Another asymmetrical element was introduced by the patching of the roof with different tiles, as discussed in Chapter 3.2. and in Article I (57-58), a practice not uncommon in other comparable contexts (Article I, 70; Article III, 385). Note that this patching in Paliambela also included cover tiles of the new type, indicating that they were acquired as replacements in sets or systems. Ethnographic evidence shows that all kinds of materials could be used in patching tiles roofs, and the results usually were not very uniform or finished.³⁹⁰

3.3.3 MARKINGS AND MEANINGS

With regard to markings on roof tiles, one major difference compared to tile materials in the western part of the Roman Empire is the relative rarity of stamps on the roof tiles in the eastern part of the Roman Empire. Stamping was virtually non-existent in the assemblages, manifesting in only some few examples of non-epigraphic, almost accidental stamps (rings, one cross stamp from Paliambela) (Article I, II and III). However, as stated in Ch. 3.2, in some specific areas of the eastern Mediterranean, primarily in connection to cities

³⁹⁰ See also Wikander 1993, 128.

where the production volume of tiles was more elevated, a portion of the production of tiles was stamped.

On the other hand, as discussed in detail in Articles I and II, the Paliambela assemblage provided a singularly good opportunity to study the finger-drawn marks, called signatures, on the surfaces of the tiles. These marks are considered common in Late Roman tiles in Greece.³⁹¹ The number of different signatures in this one assemblage was immediately noteworthy, and was the target of a specialist study presented in Article II. Signatures are a very interesting phenomenon, as they are widespread, long-lived, and relatively uniform in form all over the Roman Empire.³⁹² The apparent uniformity might have much to do with the medium (wet clay surface), which is best suited for certain types of figures, but regardless of this these signatures are common from British legionary tiles to the Roman-period tiles in the Near East, naturally with variation between areas in how common they were.³⁹³ It seems that one of their most common use areas and periods was in fact Late Roman and Early Byzantine Greece.

As Wikander states, all possible explanations have been put forwards to explain their meaning;³⁹⁴ the major ones are listed in Article II. The general consensus is that they are maker's marks, but even this consensus lacks closer definition. Articles I and especially II focused on the question of the meaning of the signatures in the Paliambela material, by looking at their internal categorization. It was hypothesized that the signatures could either represent as many workshops, equalling one workshop per signature type, or that a number of signatures would have been used in one workshop. The results indicate clearly that the majority of the signatures in Paliambela have a common provenance (Article II, 14). This gives a clear answer at least to the question of whether the signatures represent individual workshops: they do not, at least in this material. Whether the results indicate one single workshop with over a dozen different signatures or another model of production, is further hypothesized in Article II, and cannot be fully answered with the current results. Overall, it seems clear that they somehow define parts of the manufacturing process, and hypotheses as to how are also included in Article II.

This interpretation is in line with the parallel phenomenon of tile stamping and its function on tiles; as is known, these two markings frequently existed on the same tiles. Therefore, it is to be assumed that they fulfilled different functions (Article II). The meaning of stamping in different parts and periods of the Greco-Roman world has been well researched (if not without some controversies), and can very generally be summarised as usually denoting the

³⁹¹ E.g. Forsell 1996, 323; Koskinas 2011, 559; Theocharidou 1988, 108.

³⁹² See also Wikander 2017, 202.

³⁹³ Brodrribb 1987; Goulpeau and Le Ny 1989; Warry 2006b; Kurzmann 2006 for frequencies.

³⁹⁴ Wikander 2017, 205.

producer or ownership of the production,³⁹⁵ rather than production phases. Stamping was also meant to be understood outside the workshop, at least to a degree, contrary to signatures (as well as the anepigraphic stamps), which lose their contexts and content upon entering the market.³⁹⁶

The potential of signatures in the typological categorization of tiles has already been discussed in Chapter 3.2. To this can be added the fact that the signatures on pan tiles from Epirote Nikopolis, although not included directly in Gerolimous' study on stamps,³⁹⁷ indicate in some examples a clear regional/local style based on looping figures in tile corners.³⁹⁸

Some of the tiles from Paliambela carried scratched graffiti on their surfaces (Article I, 58). The graffiti from Paliambela is a simple five-corner star. Although graffiti are not very common, they do occur on tiles all throughout the Roman and Early Byzantine periods, and can be found both on examples from the western³⁹⁹ and the eastern⁴⁰⁰ Roman Empire. They seldom have a functional meaning, but are more related to occasional doodling or personalised messages.

Other markings relevant in this context are the animal tracks present in all assemblages. (Article I, 51; Article III, 382). Animal tracks are common on all Roman-period pan roof tiles both in the western and eastern provinces, and both in legionary and civilian production.⁴⁰¹ They reflect the free-ranging domestic animals present in or close to the tile workshops;⁴⁰² the theory that the dog prints might represent animal magic is marginally interesting but probably without foundation.⁴⁰³

3.3.4 CONTINUITY, CHANGE, AND AGENCY

In addition to the types of roof tiles used and their technical qualities, this research touched on the producer and user communities of roof tiles, although in a limited manner. The possibilities related to this avenue of research were based on the nature of the roof tiles as objects. Roof tiles are functional rather than aesthetic, simple rather than prestigious, and yet are visible elements in architecture, and might be valuable factors in assessing the interconnectedness of social and technological choices. Three contexts were

³⁹⁵ Although other forms and meanings existed: Manacorda 2000, 134-146; De Domenico 2015, 95-97.

³⁹⁶ Manacorda 2000, 133; De Domenico 2015, 97.

³⁹⁷ Gerolimou 2014, 216.

³⁹⁸ Gerolimou 2014, figs. 131-132.

³⁹⁹ Charlier 2004.

⁴⁰⁰ Hübner 2004.

⁴⁰¹ Tepper 2010; Gerolimou 2014; Dobosi 2016.

⁴⁰² Dobosi 2016, 120.

⁴⁰³ Gerolimou 2014, 321; see also Dobosi 2016, 124.

examined, directly or indirectly, in the research: the connection of eastern roof tiling to the changes in the overall material culture brought about by the expansion of the Empire; the agency of workshops in the technological and typological choices in tiling; and the use of architecture in influencing and creating impacts on communities. These are discussed especially in Articles II and IV.

The context of Roman conquest and Romanization

The current study was not focused on how the Roman conquest of the eastern provinces affected the material and social culture of the areas. However, its timeframe coincides with this expansion, and although not included in the core research questions, the results can be incorporated into this discussion in their own small part. This is especially rewarding in the area of architecture. It is without doubt that the spread of Roman building traditions and the further monumentalization of urban centres in the East were connected with the expansion of the Empire (Article IV). However, these traditions were not adopted wholesale or comprehensively, or simply by replacing existing local habits – a picture that is sometimes transmitted in the older narrative of emulating Roman architecture in the provinces. Instead, the changes reveal an architectural landscape of endless local variations and adaptations instead of simple emulation or replacement.⁴⁰⁴

Previous research has examined different elements of the material culture in the east and assessed the nature of their change against the backdrop of the expansion of the Roman Empire. This research cannot be summarized even partially within the contexts of this research, but some key aspects can be highlighted. The two examples relating to building practices are the spread of the use of brick in building and the innovative techniques of tile vaulting in the East. Although brick had been used in the Hellenized world prior to the Roman conquest, these contexts remained limited, even in Greece, and the use of brick expanded only in the Roman period.⁴⁰⁵ However, the use of brick never reached the level seen in Rome, and there are strong elements of regional adaptation not present in the western provinces, such as using brick bands interspersed with stone architecture, or the metrology of bricks that followed earlier eastern brick sizes rather than the standard western sizes.⁴⁰⁶ Another example is the tile vaulting techniques developed in the east, based on earlier Parthian examples and further developed in the eastern provinces during the Roman period, which also impacted building techniques in the West.⁴⁰⁷ The development of vaulting in particular provides an example of the logic by

⁴⁰⁴ Lancaster 2015b, 6; Zarmakoupi 2018.

⁴⁰⁵ Dodge 1987; Vitti 2015; Östborn and Gerding 2015.

⁴⁰⁶ See e.g. Vitti P 2010.

⁴⁰⁷ Lancaster 2010.

which building innovations were taken up in the East.⁴⁰⁸ However, both of these were technologies that made their appearance or were further developed in the context of the Roman expansion to the east. In contrast, as discussed before, roof tiling was an already established technology in the same areas. It is to be particularly noted that both the Laconian-style and Corinthian-style tile systems also continued in use after the Roman conquest of the east.

This study underlined the independent genealogy of the eastern roof tiles from those in Rome, a place usually seen as the Roman-period powerhouse, producer, and consumer of roof tiles *par excellence* (Article IV, 85). The Laconian-style (as well as the Corinthian-style) tiles of the Roman period were a continuation of the forms already familiar from the previous periods in Greece, and the more eastern tile types followed their own trajectory of development (discussed in Chapter 3.2). In none of the assemblages can we see a technical or stylistic change that could be seen as the consequence of the Roman expansion.⁴⁰⁹ This is in partial contradiction to some other categories where research has traced changes related to “becoming Roman”. What it does not demonstrate is that change did not take place; however, it demonstrates that different aspects of society responded differently to external influences, and were motivated by different things in their trajectories of continuity and change. The research suggests that integrating roof tiles into the more general narrative of change could produce a more nuanced and coherent picture of the whole.

Despite the macro-level continuity of the types, the regional variability within the tile material highlights the local responses to forces of innovation and change. What needs to be stressed is that this regional variability is not visible on the macro level. It is therefore not sufficient to know, in order to trace this regional variability, simply whether or not roof tiles are present in a particular assemblage. Variability becomes apparent only when the material is studied on a micro (site/region) level and on typological terms. This is one of the reasons why the object-level documentation of roof tiles is of great importance in any site.

The agency of workshops in technological and typological choices

The research presented here assessed that the local/regional level is the most important factor in variability, and that tile production was mostly local. In terms of the social aspect of production, this means that the workshops responsible for production had a large role in defining how the tiles looked. This is also apparent from their level of hierarchy as objects, as roof tiles are a local to semi-local, semi-domestic product requiring moderate but not

⁴⁰⁸ Lancaster 2015b.

⁴⁰⁹ Both Theodoridou (1988, 109) and Sackett (1992, 407) underline that there are no discernible technological changes related to tile production between the periods.

excessive manufacturing skills. This puts the focus of research on something other than the elite, which, in the predominant discourse, is seen as the key to cultural change.

The previously mentioned two-level typology of larger tile regions with internal regional development stresses both the continuity and variability of the tile types. The adherence to the traditional macro types is very apparent in the material, and emphasises the slow change of types against other kinds of object categories. It has already been mentioned that tile development can be best compared to plain pottery development; there are clear similarities in this material in the mechanisms of stylistic development. Research indicates that pottery producers tend to be traditional, and that pottery models change slowly;⁴¹⁰ this makes any changes detected significant. On the other hand, despite a certain level of standardization that results in the homogeneity of pottery shapes, regional diversity between various production centres can normally be detected. Many details, e.g. in clays, vessel repertoire, and decoration could be assigned to a certain village, or in some instances even to a single potter. These observations relevant in pottery also resonate for plain roof tiles, and also again point to areas where careful documentation and the critical assessment of sources are needed.

Many of the problems related to this question revolve around the choice-makers in tile production, or where the active agency lies in stylistic and typological matters. In technology transfer studies, these choices would be framed with four factors: accumulated knowledge, evident need, economic ability, and social acceptability,⁴¹¹ in an environment where styles were perpetuated chiefly through a generational knowledge transfer system (master-apprentice). Although we have a general understanding of how public and private building commissions in the eastern part of the Empire worked,⁴¹² the sources do not allow penetration to the level of the style choices for building materials, or which kinds of tiles were chosen to be used and by whom. Although direct answers are not available on the motivations and reasons behind these choices, the current study can provide some indications towards understanding them.

To begin with, considering the status and technological level of tiles as products, it seems apparent that the craftsmen in the tile workshops were largely responsible for the choices in the types of tiles produced. This would be similar to those choices made in plain pottery styles, and these choices were quite traditional, as the adherence to older Hellenistic tile types shows. It is even possible that the Roman-period Laconian-style tiles in Greece might be the same kind of deliberate style choice as the early “Corinthianizing” tile works in the Archaic period,⁴¹³ in an environment where other models

⁴¹⁰ Rotroff 1997, 98; Winther-Jacobsen 2015.

⁴¹¹ Lancaster 2015b, 4.

⁴¹² See Ousterhout 1999; Lancaster 2015b, 7-12.

⁴¹³ Winter 1993.

certainly were available. There is an immediate connection visible between the craftsmen and tiles as products, seen e.g. in the Nabataean letters present in the Petra tiles (Article IV) or the finger line signatures on the Laconian-style tiles (Articles I and II). On the other hand, the assemblage in Petra shows considerable stylistic variation that was estimated to also have a chronological dimension. This means that alongside the simple pan tiles in the Anatolian Hellenistic tradition, a more varied type (Ez Zantur II) was later developed and distributed regionally (Article IV). This type was noticeably different from the general tile types otherwise recognised in the assemblages of the region, and underlines the capacity for innovation amongst the craftsmen in their local and regional setting.

In the context of roof tiles, technology and style transfer could be affected either by the movement of ideas and people, or by the movement of the objects themselves; we have evidence for all of these in terms of roof tiles, from the trade and transport of tiles within and between regions to itinerant craftsmen or workshops, as well as other influences.⁴¹⁴ This means that even the traditional crafts such as tileries were not without outside influences; it is how they respond to this impulse which is interesting and varied. These varied meanings are clearly realised primarily in local contexts and communities assessing the “social acceptability” of the proposed solutions, as exemplified by the repertoire of finger-line signatures of local craftsmen in Greece (Article II), or the social meanings at play in tile roofing in Petra (Article IV).

The impact of the built environment

Finally, the research assessed the role that tiled roofs played in the built environment of the ancient communities. In Greece, where ceramic tiles were probably more normative as a roofing material, the use of tiles on the Paliambela church, as well as probably also in private housing in the adjoining settlement, cannot be considered unusual. However, both Paliambela, as well as the churches in Petra, belong to the tradition of basilica churches of Late Antiquity, which in itself was a very traditional and also a standardized form of building, with a number of accepted architectural traits, including sloping roofs with roof tiles (Article III). In particular in Petra, where this technology and the tradition of tiling was not common, this represents a deliberate adherence to a traditionalist architectural convention signifying both economic and labour investment, especially in the case of the Mountain of Aaron church in its almost inaccessible location.

However, perhaps more significant is how tiled roofs were employed in the monumentalized centre of Petra. This aspect is discussed in Article IV. It was suggested that the tiled roofs, which were limited to the Hellenizing public and royal buildings in the centre, produced a deliberate interplay between flat and

⁴¹⁴ Gerolimou 2014, 327-328.

sloping roofs, creating dichotomies along the lines of public-private and urban-rural. This article stressed the impact of such deliberately created roofscapes on the viewers, transmitting a message of cultural affiliation and elite affluence through an active agency of these groups. Although this view of Petra may ultimately be too generic, it still resonates in its fundamentals with the “calculated staging of monuments” (Article IV, 101) of the architecture in Petra in general.⁴¹⁵ Similar thoughts have been expressed by Philip Mills in Beirut, where he proposed that different types of roof tiles were deliberately chosen (“consumer choice”) as public displays of identity (Article IV, 108).⁴¹⁶

* * *

These results, although preliminary in nature and based on small sample sizes, suggest that the choice of what kind of roofing system was to be used in a structure was not an insignificant one; and neither was the choice of which kinds of tiles were to be placed on it. This is again an indication that the object-level documentation of roof tiles is of great importance in any site or structure.

⁴¹⁵ Citing Schmid 2008a.

⁴¹⁶ Mills 2013, 112-114.

4 CONCLUSIONS AND FUTURE RESEARCH PERSPECTIVES

This study provided new information and perspectives on the plain roof tiles used in the eastern regions of the Roman Empire. It has specifically looked at three assemblages from the area where roof tiles have been well documented, and used them as starting points to discuss the regional nature of the practice of roof tiling in this area; these results were presented in the previous chapters. This concluding chapter draws together the most important conclusions from the study and discusses future research perspectives that have arisen during the work.

Key conclusions

One key result of this study is an emerging typology of the plain roof tiles in the East, presented in Chapters 3.1 and 3.2. In comparison to the Roman west, with its fairly uniform use of the *tegula* tile type, the eastern parts of the Roman Empire had a more varied repertoire of tile types in use, both before and during the Roman period. It was demonstrated how the types used in the Roman period were the descendants of the types that came into use in the 7th and 6th centuries BCE in Archaic Greece, and formed the typological basis of the tile types used later in this area, but also in Roman Asia Minor and the Near East (Chapter 3.1.1). These types were transformed over time, but remained recognizable as systems throughout the Classical and Hellenistic periods. They also survived the Roman conquest in the eastern part of the Mediterranean, regardless of the type used, even though connections to regions where Roman *tegulae* were used were frequent. In particular, it was noted that an adherence to the use of the specific combinations of pan and cover tiles that originally defined the Archaic tile systems (the Laconian, the Corinthian, and the hybrid system) continued to be followed throughout the period under observation.

However, despite the *longue durée* of the prototype tile systems and the challenge presented by the conservative traits of the material, the tiles did not remain unchanged, but developed in subtle ways. The analysis recognized, described, and discussed potential elements of the Roman-period tile types where change can be followed, reinforcing previous views that a more nuanced typology might be possible, providing a picture of the Laconian-style tiles in the Greek area and the Anatolian Hellenistic-related tile types in the Near East (Chapter 3.2.1). These types were given a preliminary descriptive definition in each area, although the data still does not allow the full presentation of datable regional typologies, only a roadmap towards them. In addition to fabric categorization, meaningful elements in the definition of typologies include

variations in shape (tapering), decoration and surfaces, fitting devices, and size. For the Laconian-style tiles in particular, the use of fingerline signatures presents a very interesting possibility for regional classification towards the Late Roman period. On the other hand, both the profile of the pan and the development of the flanges should be more closely analysed in order to determine whether they are features that can be used in constructing typologies. In the Roman-period tiles in the Near East, the development of cut-outs and ridges was especially meaningful in light of this material.

This concise look at the tile types of the eastern Empire emphasizes two things: that the types used in the Roman period both remain traditional, as they follow the Hellenistic traditions in all of the areas examined in this study; and that despite remaining traditional, they display subtle changes that provide the potential for developing more detailed regional typologies. The results show that we should understand any tile typologies on two levels: one on a macro-level, recognizing larger tile regions, and one on a narrower regional and perhaps even local level, representing variation within the macro regions. Based on the overview, the study outlined macro regions of tile traditions in the Roman period in the eastern part of the Roman Empire (Chapter 3.2.2). These encompass the areas of Greece and the southern Balkans, where the Laconian-style tiles dominated; Asia Minor where the hybrid system was dominant, but with some Laconian- and Corinthian-style assemblages present; and thirdly the Roman Near East, again with hybrid types but in more varied versions and with the absence of the Laconian-style types. In addition, both Cilicia and Cyprus formed strong regional centres, distributing tiles widely in the region, including down the Levantine coast. It is emphasised that these macro regions contain areas of significant regional variation, which is only partially recognized even in this research, let alone in the general research literature.

The lack of stamping is keenly felt in this material, but should not impede us from finding other ways of categorizing and dating the material. One key need is to advance from generic “Laconian”, “Corinthian”, or “hybrid” typologies to a more nuanced classification of tiles, as these are not sufficiently sensitive and can even impede the development of more detailed typologies. These tile regions of the Roman-period Greek East are for the first time illustrated in Fig. 15.

A look at the roof tiles in the study area revealed a large variation in the use contexts in the Roman period, reflected in the presence of tiles in the archaeological landscape (Chapter 3.1.2). In summary, while frequent in the Greek archaeological record in the Roman period, ceramic tile has a very low to minimal penetration into the Roman-period countryside of the Near East, in particular in southern Levant. In this area, tile use contexts were limited to urban public and finer domestic architecture, although evidence is still too limited to draw overreaching conclusions and regional differences are certainly to be expected. More research is needed to clarify this initial assessment as presented in this research.

In addition to the typological analysis of the tiles and the development of the tile regions, the study has explored the question of the production contexts of the tiles, with the key results outlined in Chapter 3.3. In all of the case sites, the production of tiles was assessed to have been local. Although the production processes for roof tiles were broadly similar across the Roman Empire, the study outlined the differing nature of the production units compared to Roman Imperial production; the nature of production in the east was characterized more by smaller units and private production, with some public actors involved. The careful documentation of the assemblages also allowed for the description and analysis of various production details visible on the tiles, as well as assessing how the tiles were used in the construction, either placed on the roofs or used in secondary contexts. In contrast, several questions related to production, distribution, and markets could not be examined due to the nature of the material studied.

A particular focus of the research was the frequent and varied finger line signatures on the Roman-period roof tiles from Paliambela. A chemical analysis performed confirmed that most of these signatures belong to the same provenance group. This confirms that the different signatures do not directly represent different workshops, as has also been proposed by earlier research. The more precise organization of the production process remains outside the ability of this analysis to explain, but different scenarios were presented in Chapter 3.3.2., based on the assumed production of the tiles in one workshop.

Chapter 3.3.3. summarized the results of those parts of the research that analysed the roof tiles in their social context. One such is related to the process of Romanization, or the processes of cultural transformation after the Roman conquest of the provinces. It was demonstrated that there are no visible signs in these particular assemblages, either typological or technical, to indicate that the conquest influenced the production of roof tiles in the East to any discernible degree; on the contrary, signs of either unrelated development, or possibly even conscious resistance through types and styles were detected. The way in which this category of materials developed during this period should add a useful element to the emerging picture in this discussion.

This is considered particularly interesting in relation to the nature of ceramic roof tiles as products of small-scale crafts industries, where the choices of the craftsmen were presumably of primary importance in the stylistic and technical development of the tiles. Although the typology of tiles as a group is only just developing, the results clearly indicate that with a better understanding of the typology there is much potential in this category of material for improving our understanding of how people, ideas, and materials related to tiles moved. This in turn can further clarify questions related to technology transfer, the adoption of materials and ideas, crafts industries, trade, economy, and eventually the transformation of societies.

Chapter 3.3.3 also highlighted the results of the research that analysed tiles as elements of the visual fabric of the cities in the form of roofscapes, i.e. the view offered by the different roofs. This is part of the larger discussion on

how ancient architecture could consciously impact viewers and create different meanings, and be used in legitimizing power and emphasizing social standing. It was demonstrated that in Petra, as a part of the Hellenizing tendency in public building, tiled roofs formed conspicuous parts of the Petra roofscape, emphasizing parts of the city as public and urban as opposed to those areas more private and rural-oriented.

Implications and further research

The first major implication of the research presented here is that plain terracotta roof tiles as an archaeological category of materials have significant value as a data source, and this value is currently underutilized. In the course of this study, the author came across mentions of clearly significant tile assemblages where their value as a data source was not utilized, either through complete disregard or overly general documentation, and much information was therefore lost. Even the current study cannot be considered more than a preliminary summary of roof tiling in the eastern part of the Roman Empire.

Most, if not all, of the above outlined conclusions based on the research presented are reliant on the sufficient documentation of the assemblages in excavations and surveys. This clearly implies that there is an urgent need to develop and mainstream the practice of documentation for tiles, especially in excavations, in order to create a large enough body of evidence to refine the emerging, more detailed typologies of the tiles of the eastern Roman provinces. There should not be a single excavation in the eastern part of the Mediterranean area that does not in the future document at least on some basic level its tile finds. This is a necessary effort, as local variations and specific contexts are our key to understanding the meaning and significance of the details that we see in any group of remains; the lack of comparative material is very acute in this field of research. Regional or local variations are also keys to following the macro level development in typology or technology transfer. It is hoped that tile will enter the list of materials to be included in excavation and survey reports on a standard basis.

In support of such a demand, this study has collated some key issues in documenting tile assemblages. The guide to good documentation practices of tile assemblages is attached to this study as an Appendix, and rests on some previous good practice presentations by other researchers, in addition to the results of the current study. It is intended first of all to provide sufficient information for a proper documentation of any assemblage, but also to show that documenting this material, which is usually considered cumbersome (if not worse) and takes up a not insignificant amount of storage space, need not be overwhelming, and should be well achievable by any scientifically-oriented research group. The benefits of such documentation for the wider questions in research have been repeated throughout this study.

This study has placed much emphasis on the typology of the assemblages. It is considered to complement the approach that is based on the identification of fabrics. As a result of the study, it seems apparent that a reliance solely on either method fails to maximise the information potential of this material. However, as the focus of earlier research has been on the identification of fabrics, it is emphasised here that it is necessary to document the tiles as one would document pottery, with stylistic features that have potential as elements in a typology, in order to utilize the information potential also embedded in this aspect. In particular, as the typological definitions for plain roof tiles are only developing, it would be necessary to not overlook smaller variations in the tiles. Eventually, it is hoped that more detailed regional typological sequences of roof tiles and a more precise identification of the key morphological features will develop. Additionally, context-reliant as well as absolute datings of the assemblages would be very important for this development.

In addition to developing the documentation, study, and presentation of the tile assemblages, there are several potential avenues for further research relevant to this study. Both the areas of Greece and Jordan would benefit from closer regional analyses of all the available roof tile assemblages; tracing these is very time-consuming, as they are mostly published only on the level of excavations reports, and would require the search and identification of any assemblages preserved and obtaining access to them for research. In addition to the areas mentioned, Asia Minor (modern Turkey) is even more summarily covered in the study, despite its position in the very interesting transitional area between the Laconian-style macro-area and the Near East. Looking more closely at the Roman-period tile assemblages in this area would be of significant importance. Generally, there is ample room for further regional analysis in any area of the eastern Roman Empire.

Many different kinds of assemblages would benefit from further research; not only rich excavation assemblages such as Paliambela, with more or less intact destruction layers, but also more modest and difficult-to-interpret survey assemblages. A real step forward would be achieved if we could in the future assign better dating and provenance to tile fragments found as survey finds. It is hoped that developing methods, such as pXRF provenancing, will in the future make such analyses faster, more cost-efficient, and more widespread. We would also be better off recognizing more clearly the find contexts that roof tiles come from. One such context concerns rural buildings both in the Greek mainland and in the Near East. The general expectation already mentioned is that tiles were used in buildings at all levels of the architectural hierarchy in the West, especially in Italy; how this operates in the East would be a very interesting question to study more precisely than has been possible within this study.

A particular context with usually well-preserved tiles are the tent-like pan-tile-covered inhumation graves (gr. *keramoskepsis*/it. *a capanna*), a long-lived phenomenon, common all over the Empire but especially frequent in

Roman and Early Christian Greece. It is more common to find intact tiles in tile-covered graves than in excavations of settlement sites, and definitely more than in surveys, and in many cases other datable material is also present in such contexts. Unfortunately for tile research, these tiles are usually not well documented, although they have vast potential as sources for tile research. It is strongly encouraged that whenever well-preserved tile graves are published, the cover tiles are also included in the documentation.⁴¹⁷ A similar concern can be expressed for tiles found in underwater wrecks, whether the tiles are thought to be cargo or parts of the ship structures.

In addition to typology and contexts, the technology and production of tiles have several further avenues of research available. Despite some progress in this direction included in this study, more detailed methods applied to a larger assemblage would be needed for conclusive results, e.g. on the provenance of tiles in various regions. Another related avenue for research is production methods, which are clearly characterized by considerable amounts of variation in different parts of the Mediterranean, as well as the technical details of the tiles. To this end, this study and previous research have clearly demonstrated that analysis methods similar to those used for pottery are also applicable to terracotta tiles. One very interesting area concerns the fingerline signatures on Laconian-style tiles, and on other tile types, which would benefit enormously from a larger overview than has been possible within this study. There are complex factors involved in the process how they end up on the tile surfaces, and these factors are clearly much reliant on the social context wherein the tiles were produced. The social factors of the workshop floor are in general one very interesting area of research, from the point of view of the mechanisms of conservatism and change in low-level hierarchy items, of technology transfer, and of the role of the producer on the workshop floor in the transmission of ideas.

* * *

This study has taken a holistic view of the habit of tiling roofs with terracotta pan and cover roof tiles in the eastern part of the Mediterranean during the Roman period. Approaching a fairly simple material group such as roof tiles from this angle serves as a reminder not to take for granted assumptions about the apparent homogeneity, or, for that matter, lack of meaning that is sometimes assumed out of long habit for certain source materials. The results demonstrate the innate and considerable information value of roof tiles as an archaeological material category. This study has been carried out in the hopes that roof tiles will take their place in the group of universally and uniformly documented categories of materials in research projects, to be used as a source material on par with other such materials for the more precise reading and understanding of past societies.

⁴¹⁷ See Slane 2017 for a recommended study.

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APPENDIX – GUIDELINES FOR TILE DOCUMENTATION

“If the fragments of roof tiles are few, small and undiagnostic, do not abandon hope. Even such an amount of material may allow for conclusions of some importance”

– Wikander 2017, 191

Introduction

This appendix is intended to support and facilitate the handling, selection, retention, and documentation of ceramic roof tiles in archaeological research. In particular, it concerns the Roman-period roof tiles from the eastern parts of the Mediterranean, to which area and context it is particularly suited.

These guidelines are the result of a PhD project on Roman-period roof tiles. They have been written based on the practical experiences and insights gained during this project, and do not constitute a formal guideline for the documentation of tiles. In addition to personal experiences, these guidelines have made frequent use of the already existing guidelines on the documentation of tiles material. Good examples for such guidelines can be found e.g. in Wikander 2017, Warry 2006b, Mills 2013, and Shepherd 2006. Support for the process and approaches is also offered by pottery study and field guides. One example of such a guide is the Standard for pottery studies in archaeology (2016) from the UK: [http://romanpotterystudy.org/new/wp-content/uploads/2016/06/Standard for Pottery Studies in Archaeology.pdf](http://romanpotterystudy.org/new/wp-content/uploads/2016/06/Standard%20for%20Pottery%20Studies%20in%20Archaeology.pdf). A relevant field guide is the Corinth excavation manual (Sanders, James and Johnson 2017).

It is hoped that these guidelines make the documentation of roof tiles more frequent and more uniform across different projects. It has been demonstrated in the related study that valuable information is gained from this material for individual sites and areas. Ultimately, tile material offers the same kind of interpretative potential as pottery does, for questions related to trade, economy, volumes of production, technology transfer, crafts processes, and cultural affiliation and agency. Ceramic tile materials should therefore be part of the standard materials research programme of archeological projects. Additionally, results from individual research projects will help build up regionally meaningful pools of data, even if no direct results for a single site are expected. A key question in the documentation is: how to decide what is important and what not? How is it possible to manage “... a massive quantity of exceptionally unappetizing material”? (Ridgway 1995, 384)

It is highlighted that even selective sampling from a limited amount of material will be useful if carefully documented. Adding the documentation of

tiles and brick to a research strategy will therefore not require undue resources from projects nor result in overfull storage. This guideline is designed especially to facilitate a minimum level of documentation; it is of course advisable to make a full and detailed study of tile and brick material from suitable field projects, and such studies require a more detailed expert-led research strategy. In all cases, the retention and documentation strategy for tiles should be planned beforehand alongside all other material categories, and then be actively implemented during the research.

The minimum information to track about ceramic building materials would be whether they are present in a context or not. This kind of basic information can currently be found in many field reports. This study underlines that for any larger research questions, and especially for the purposes of developing a typology, this is not a sufficient level of documentation. An analogy with pottery has already been made on several occasions; in this regard the analogy would be that a field report would merely mention that pottery was “present” at the site, which would be unimaginable in almost any context. Consequently, similar research strategies as those followed for pottery can and should be applied to tile and brick material. This guideline is written with the aim of documenting the characteristics of the material, not just its presence or absence.

Contexts as a defining factor

As in planning any research strategy, the context is a decisive factor. It is a different issue to face an assemblage of tiles from a fallen roof in excavations than to encounter fragments in surveys, and the plans for a retention strategy should be formulated accordingly. Clearly, kiln sites require a different strategy than settlement sites, and dumps are handled differently from cemeteries. In some areas, such as most of the Near East, Roman-period CBM is rarer, and its presence should be more of an inducement for documentation; in some specific contexts the mere presence of tile would be meaningful. On the other hand, it is important to know and document the precise find contexts of tile, because this will have an impact on the interpretation. Each research project must therefore adjust its way of handling tile and brick material to its specific needs.

The following presentation is divided into practical advice concerning field strategies and excavation, sampling and retention, and cataloguing and documentation.

Field strategies and excavation

The first steps towards tile documentation are taken during the excavation or survey event.

With regard to excavation, following the analogy with pottery, all encountered tile and brick fragments should be included in the initial analysis. Regarding how an excavation should approach units with tile finds, Wikander (2017, 191-192) has outlined some specific, tile-related advice. This is based on long experience and is overall very applicable, although his guidelines are based on Archaic tiles from Italy.

1. Do not remove tile fragments until it has been established that they are not a complete tile layer.
2. Document whole collapse layers. These might represent original roofs, and important information is contained in the way the tiles are situated in the fall.
3. Record documented fragments' places in a layer. Pay attention to connected or overlaying/successive layers. Elevations should also be recorded to understand the dimensionality of the deposits.
4. Record in max 1 x 1 meter grids. This will help later in the joining of the pieces.
5. Pay specific attention to all fragments that are not pan or cover tiles.
6. Clean all fragments before discarding, to detect any markings and decoration.

These basic guidelines are intended to safeguard information needed for many aspects of study, including: reconstructing roofs and building phases, identifying successive falls, clarifying technical details of construction, and analysing use contexts and habits. One example of documenting a tile fall can be seen at Paliambela (Fig. 1), where the destruction layer of the church was carefully exposed and documented both by photographing and by making schematic drawings of each exposed layer and tile position. The fragments of the complete tiles from the layer were numbered in situ and kept together in this way during cleaning and documentation.



Fig 1. In Paliambela, the fragments of the complete tiles from the layer were numbered in situ and kept together in this way during cleaning and documentation.

The Corinth Excavation Manual (Sanders *et al.* 2017), a new source for excavation methods in the Mediterranean, has a valuable chapter on handling roof tile finds from the excavations, so it is cited here in full:

“Small fragments of roof tile are a frequent find in deposits at Corinth and are of little value in dating the context. Whole tiles or tiles with a preserved edge or that show the shape of the tile are more informative. For this reason, a fall of roof tiles or a deposit of dumped destruction debris in a pit, well, or cistern should be treated more carefully. Collect the tiles in the field, weigh them, note whether they are Laconian (round in profile) or Corinthian (flat in profile; see §12.4.1), describe them (e.g. if they are pan or cover tiles, painted or plain), and estimate the percentage of each by weight in the Notes field on the Deposit Sheet or Structure Sheet. Lay out any broken tile fragments from destruction debris and look for joins. If no joins can be made between many broken tile fragments, this suggests that the context is not a primary deposit of destruction debris. If a complete profile can be reconstructed, sketch the tile and describe its dimensions (length, width, thickness, and height). All whole tiles should be taken to the pot sheds along

with the pottery from the same context. Non-descript, non-joining tiles should be left on site.” (Sanders et al. 2017, 90)

Mills discusses sampling strategies for different tile deposit types in his work (Mills 2013, 19). He distinguishes between unstructured and structured deposits. For large unstructured deposits, Mills suggests an approach where a large enough complete sample is retained, and the rest of the material scanned for unusual forms, complete dimensions, and markings. In addition, an estimate of the complete volume of discarded material should be made. For structured deposits, Mills suggests more refined strategies, such as a grid-based system or even a more sophisticated adaptive cluster sampling method.

For surveys, project-specific sampling strategies are followed. The same strategies that are applied to pottery can be applied to tile and brick. There is an ongoing project “Roof Tile Analysis on Survey Archaeology Projects”, which will in the future produce more information on roof tile finds from surveys (Salem 2017). The initial results recommend the following guidelines in documenting roof tiles from surveys:

For Survey Unit Tile Collection & Recording:

- Count all tile fragments seen while walking a transect
- Collect one fragment of each fabric present
- In the collection of the fabrics, try to retain tiles that contain part of the tile’s edge
- Collect all fragments with paint, grooves, and/or etchings
- Collect all fragments of unusual shape
- Collect all tiles with relative completeness

For high concentrations of tile, forming a grid over the area is most effective for documentation and collection. For each grid:

- Gather all tile fragments within the specific grid section
- Photograph the collected pile for record
- Take GPS point for location
- Count the fragments
- Find the total weight for all tile within the grid
- Collect a few representative tiles and any diagnostic tiles for further analysis

Sampling and retention

Most research projects have their own defined systems for processing pottery found during excavation. These same processes can also accommodate tile fragments. In the Corinth manual, pottery sorting and selection is performed after each field day (Sanders *et al.* 2017, 99). Wikander describes a specific “tile cemetery”, where tile finds can be processed, cleaned, and rechecked for markings, and especially where the joining of the fragments can be attempted.

Before making a decision on what material to retain, or not, care should be taken that the volume and nature of the tiles in each deposit is documented. This is vital information for answering several research questions related to tiles, when it is necessary to know the relationships between what was found and what was documented. A simple example of this is in Article III, 378, where the ratio of found/documentated tile material could be calculated based on the information recorded in the excavation notebooks from Jabal Haroun. This first-level documentation can be done in multiple ways; Mills (2013, 21) and Clemént (2013, 29) provide examples of simple deposit-based documentation forms for tile and brick for initial recording, which will help record the necessary basic data. The studies included in this research used a similar modified data entry form for hand-recording data in the field.

However the basic documentation is made, it is important to note that there would be much value in recording the volumetric information for the deposits as a whole: how much and what kind of tile was present in each deposit. If all finds cannot be retained, this means that during the initial documentation all fragments should be counted, weighed, and assigned a preliminary type, even though this material will later be dumped (see also Wikander 2017). It should also be noted that the frequencies of types would need to be recorded. One good way of doing this would be to take all tile finds through the same process of cleaning, sorting, and reading as pottery. In addition, both Wikander (2017) and Clemént (2013, 29) recommend counting all corners of pan tiles and cover tiles separately, to record the information necessary for estimating the minimum number of individual objects, i.e. tiles.

All tile fragments, unless some part of them can already be processed and documented on site, should be cleaned and sorted. The Corinth excavation manual records a process where all pottery is retained, processed as soon as possible, and sorted. This sorting, preferably by a tile expert, will help to quickly sort the finds into those that will be registered and those that will be dumped.

Wikander provides a practical rule for deciding which finds should be retained, in order of importance (his term “register” has here been replaced with “retain”), if retaining all tiles is not possible:

1. Retain all special tiles
2. Retain all complete pan and cover tiles
3. Retain as many joining tiles as possible

To this can be added that any marked tiles should be considered for registering (4. Retain as many marked/decorated tiles as possible), and that fabrics should also be a factor in the sorting, i.e. the tiles might seem identical, but the fabrics clearly are not. In this case, care should be taken that the frequency and nature of fabrics is also noted on the initial documentation forms, and that sufficient samples of different fabrics are also retained (see also Mills 2013, 20).

After making a decision based on the research strategy applied and the careful screening of the tile assemblage, as well as documenting the overall volumes of the finds in each context, the material that has not been selected for registering can be discarded.

Cataloguing

Tile finds that have been selected for registering can now be catalogued according to the conventions set out for each project. Usually this is done either in a joint project database, or a separate data storage for individual finds categories. Mills (2013, 21 ff. and 119 ff.) provides one example of a relational database model for registering tile and brick finds. A simpler Excel sheet was used for managing the data for the research in this work.

In addition to the data normally collected for ceramic fragments, it is again stressed that fabric identification should be a necessary step in the documentation and cataloguing process. However, this study has taken a specific interest in the form of the objects, and identifying elements that may be effective in building up typologies. It was recognised that in addition to fabric categorization, meaningful elements include variations in shape (tapering), decoration and surfaces, fitting devices, and size. In the Laconian-style tiles in particular, towards the Late Roman period the use of fingerline signatures presents a very interesting possibility for classification. On the other hand, both the profile of the pan and the development of flanges should be more closely analysed in order to determine whether they are features that can be used in constructing typologies. In the Roman-period tiles in the Near East, the development of cut-outs and ridges proved especially meaningful. Care should be taken that these elements are included in the description, either in text or in the images, preferably both.

13. Pan roof tile; Pl. IV.

(T-002, J98/L8/P2, NW of *narthex*, tile destruction layer) L. 85.5, W. 45, Th. 2.4 cm. Weight 12.9 kg.

Pan roof tile in 22 joining fragments; one side and one end preserved complete, and the rest partially. Hard fabric of dark red (II) with white and black inclusions. Three parallel finger lines on fairly smooth upper concave side, forming a two-tailed figure of eight to one end of the tile (Type C). Convex side rough, undecorated. See Hidri 1987, tab. VI, 4.

Fig 2. A sample entry in a catalogue for pan tile material from Article I.

Different research projects attach tile and brick material to different categories of finds in the final publication, according to their agreed conventions. A natural place for them would be as part of the architectural remains, or as a separate chapter after the coarseware pottery.

Drawing and images

Crucially valuable information is transmitted through images and drawings of tile material, and therefore cataloguing should be accompanied with representations in images. The goal should be that all registered finds are either drawn or photographed for publication, or at least representative examples of each type and feature. Standard pottery drawing conventions can be used for roof tiles. Both top-down/surface view and a profile view should be included, and for profiles it should be indicated from which part of the tile they are drawn. Drawing only flange profile images is usually not sufficient as documentation.

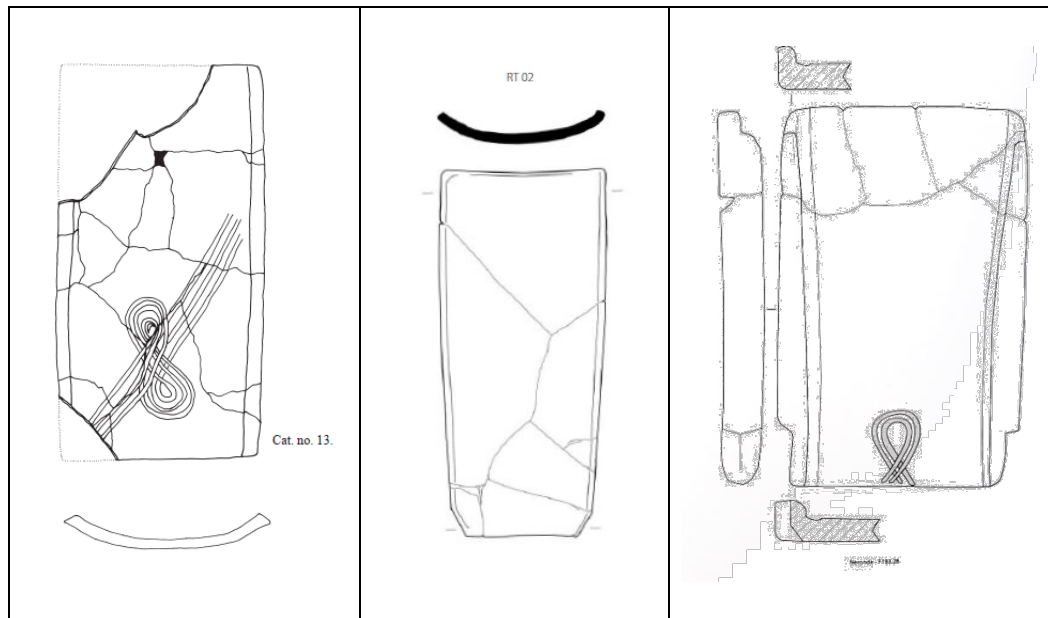


Fig 3. Examples of drawings of pan tiles: Paliambela (Article I); Metaponto, S Italy (Perugino and Vollaro 2014) and Néronde, Gaul (Clemént 2013).I.

Best practice examples

Well-documented tile assemblages can be studied e.g. in the following publications:

Perugino and Vollaro 2014, 'Chapter 5. Roof tiles', in E Lanza Catti, K Swift and J Coleman Carter, *Chora of Metaponto 5: A Greek Farmhouse at Ponte Fabrizio*, pp. 353-360. University of Texas Press, Austin.

Shepherd, EJ 2006, 'Laterizi da copertura e da costruzione', in EJ Shepherd, G Capecchi, G de Marinis, F Mosca and A Patera (eds), *Le fornaci del Vingone a Scandicci. Un impianto produttivo di età romana nella valle dell'Arno*, pp. 165-200. *Rassegna di Archeologia*, 22/B, 2006.

Wikander, Ö 2017, *Roof-tiles and Tile-roofs at Poggio Civitate (Murlo). The emergence of Central Italic tile industry*. Skrifter utgivna av Svenska Institutet i Rom, 4^o, 63, Stockholm.

Witte, J 2012, 'Roman and Byzantine Bricks and Tiles, 1988-2004', in CS Lightfoot and EA Ivison (eds), *Amorium Reports 3: The Lower City Enclosure. Finds Reports and Technical Studies*, pp. 297-377. Ege Yayınları, Istanbul.